COMPARISION OF ADD ON INTRATHECAL FENTANYL VS MAGNESIUM SULPHATE TO HYPERBARIC ROPIVACAINE FOR LOWER ABDOMINAL SURGERIES

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Dedicated

to

My Family,

Friends

&

Teachers

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Onwards and upwards!

Dr. Sanjamjot Singh Suri

LIST OF ABBREVIATIONS

ASA	American society of Anaesthesiologists
CNS	Central nervous system
CSF	Cerebrospinal Fluid
CSF	Cerebrospinal Fluid
CVS	Cardiovascular System
DBP	Diastolic blood pressure
DMCH	Dayanand Medical College & Hospital
ECG	Electrocardiogram
HR	Heart rate
IV	Intravenous
LA	Local Anaesthetic
MAP	Mean arterial pressure
mcg	Microgram
mg	Milligrams
$MgSO_4$	Magnesium Sulphate
mins	Minutes
ml	Milliliters
NIBP	Non invasive blood pressure
NMDA	N-methyl-D-aspartate
NPO	Nill per oral
NSAIDs	Non-steroidal anti-inflammatory drugs
SBP	Systolic blood pressure
SpO_2	Oxygen saturation of blood

ABSTRACT

Introduction: Hyperbaric ropivacaine a newer local anaesthetic agent has found its use for spinal anaesthesia with less systemic toxicity**.** Adding opioids as adjuvants enhance the efficacy and duration of action of the local anaesthetic and also decrease the dose required for spinal anaesthesia. Opioids, however, have various side effects like pruritis, nausea vomiting etc. Non opioid adjuvants like magnesium sulphate can also be used to increase the efficacy of local anaesthetics.

Objectives: To compare intrathecal fentanyl and magnesium sulphate as adjuvant to 0.75% Hyperbaric Ropivacaine in terms of onset and duration of sensory and motor block and hemodynamic parameters

Materials & Methods: A total of 60 ASA grade I and II patients with age 18 years and above of either sex were selected and divided into two groups of 30 patients each. The study was randomized controlled, double blinded. Group F received 2.5ml of 0.75% hyperbaric ropivacaine + fentanyl 25mcg and group M received 2.5ml of 0.75% hyperbaric ropivacaine + 0.2ml of magnesium sulphate (100mg) + 0.3 ml of distilled water. Characteristics of block in terms of onset and duration of motor and sensory block, time to attain maximum block height, time of analgesia were recorded along with hemodynamic parameters (SBP, DBP, MAP and SPO2).

Results: The mean time of onset of sensory block was less in fentanyl (4.10 ± 1.84 mins) as compared to $MgSO_4$ (6.60±3.38 mins). There was delay in onset of motor block in $MgSO_4$ group (7.87±6.58min) as compared to fentanyl group (4.20±2.14 mins). The duration of sensory block and motor block, maximum sensory block height attained, time to attain maximum sensory block height, duration of analgesia, hemodynamic parameters were comparable in both groups.

Conclusion: Fentanyl is better adjuvant to 0.75% hyperbaric ropivacaine than $MgSO_4$ due to its faster onset of sensory and motor block, but both agents had comparable duration of block, hemodynamic parameters and post operative analgesia time.

Keywords: Hyperbaric ropivacaine, Subarachnoid block, Fentanyl, Magnesium Sulphate, Post-operative analgesia, lower abdominal surgeries, spinal anaesthesia

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INTRODUCTION

Spinal anesthesia is highly preferred anaesthetic practice involving gynecological, lower abdominal, pelvic, lower limb, and urological procedures. The first successful demonstration in humans occurred on August 15th, 1898, when German surgeon Dr. August Bier used the Quincke method to inject cocaine into the intrathecal space, pioneering operative anesthesia. Since then, this technique has undergone refinement, evolving into the contemporary approach to spinal anesthesia. This method provides straightforward, effective, and safe analgesia throughout the perioperative period. Its notable advantages include reduced intraoperative blood loss, suppression of the surgical stress response, decreased incidence of nausea and vomiting, lower likelihood of thromboembolic events, and enhanced postoperative pain relief.[1,2]

Ropivacaine is a newer longer acting local anesthetic agent, structurally akin to bupivacaine. Unlike bupivacaine, which is a racemic mixture, ropivacaine is a pure S (-) enantiomer. It was developed for purpose of decreasing potential toxicity while enhancing the efficacy of sensory and motor blocks.[3,4]

Ropivacaine was introduced into clinical use in 1996 and has consistently shown a superior safety profile compared to bupivacaine. It exhibits reduced central nervous system and cardiovascular toxicity, making it widely applicable for various doses and clinical indications. Ropivacaine also has a higher clearance rate and shorter elimination half-life compared to bupivacaine, which may lower the risk of systemic toxicity. Its lower lipid solubility results in reduced penetration into myelinated motor fibers, leading to lesser motor block and greater sensory motor differentiation. These properties contribute to its reduced potential for cardiotoxicity and neurotoxicity, making ropivacaine a safer alternative to racemic

bupivacaine. In comparison to bupivacaine and levobupivacaine, which typically offer longer durations of block than ropivacaine, intrathecal ropivacaine demonstrates fewer hemodynamic side effects and greater cardiovascular stability.[3,5,6]

The density of the local anesthetic compared to the patient's cerebrospinal fluid (CSF), known as baricity, significantly influences the extent of spread achieved after intrathecal administration. Baricity determines whether the anesthetic will settle, remain at the injection site, or rise within the CSF. This affects how the drug spreads, impacting the level and duration of analgesia. Therefore, choosing the appropriate baricity is crucial for achieving the desired level of anesthesia during procedures, considering factors like patient positioning and procedural requirements.[7]

Hyperbaric solutions, compared to plain solutions, offer more consistent and predictable spread in the direction of gravity during spinal anesthesia. This characteristic reduces variability between patients, ensuring anesthesia levels are more reliably adjusted for surgical needs. In contrast, plain solutions exhibit greater variability in effect, potentially leading to blocks that are either too low for surgery or excessively high, causing unwanted side effects.[7]

Studies comparing isobaric and hyperbaric intrathecal ropivacaine have shown that hyperbaric preparations generally achieve higher success rates, faster onset of action, and more consistent and predictable sensory and motor blocks. Hyperbaric ropivacaine also provides a longer duration of clinically effective block, although recovery from sensory and motor block tends to be faster compared to isobaric ropivacaine.[8,9]

The duration of local anesthetic (LA) action can be extended by either increasing the dose or administering the drug through a continuous infusion. However, this approach can potentially cause dose-dependent

side effects affecting the cardiovascular system and/or central nervous system. So adjuvants are used to prolong duration of neuraxial block. Adjuvant drugs have the potential to enhance the effectiveness of both peripheral blocks and central neuraxial blocks.

They can also reduce systemic toxicity from local anesthetics primarily by prolonging sensory block duration, improving motor blockade, and thereby reducing the overall required dose of local anesthetics.[10]][11,12]

An ideal adjuvant should not only increase the speed of onset of action of the local anesthetic (LA) drug but also allow for a reduction in its dosage. Additionally, it should provide hemodynamic stability, optimal sedation, and minimal adverse effects. Various drugs have been used as adjuvants to spinal anaesthesia. They are broadly divided into opioids and non opioid adjuvants.

Opioids acts as agonists at opioid receptors, which are distributed widely throughout the body, including various regions of the brain (such as the cerebral cortex, thalamus, hypothalamus, amygdala, basal ganglia, brainstem, and reticular activating system), the spinal cord, and non-neural tissues like the gastrointestinal tract.[13,14]

When opioids are administered via neuraxial (spinal or epidural) routes, their analgesic effect primarily results from binding to μ opioid receptors located on both pre and postsynaptic receptors in the substantia gelatinosa of the dorsal horn of the spinal cord. They also enhance the effectiveness of the nerve block and decrease the requirement for opioids after surgery. In situations where surgery commences promptly following a spinal injection, such as during a caesarian section, fentanyl (10 to 20 mcg) is frequently included because of its quick onset to enhance pain relief during the operation.[12,15,16] [17]

While neuraxial opioids prolong analgesia effectively, their absorption into the blood stream can lead to systemic side effects. These may include respiratory depression, vomiting, pruritus, dizziness and urinary retention. Pruritus and sedation are primarily seen with use of intrathecal fentanyl. The severity and incidence of these side effects is mostly dose dependent.[15,18]

Non-opioid drugs can prolong the duration of analgesia without causing side effects such as nausea, vomiting, or respiratory depression associated with opioid use. Some examples of non-opioid drugs used intrathecally as adjuvants include magnesium sulphate, ketamine, midazolam, adenosine, and NSAIDs (Non-Steroidal Anti-Inflammatory Drugs).[10,11]

Magnesium sulphate acts as a centrally acting antagonist of the NMDA (N-methyl-D-aspartate) receptor. This receptor is involved in the transmission and modulation of pain signals in the central nervous system. Painful stimuli trigger the release of neurotransmitters such as aspartate and glutamate. These neurotransmitters promote the influx of calcium ions into cells, which in turn contributes to the signaling of pain sensations. Magnesium sulphate acts as a physiological antagonist of calcium, particularly in the central nervous system (CNS). This action contributes to its role as an anti nociceptive agent. By antagonizing calcium, magnesium sulphate helps regulate neuronal excitability and modulates the transmission of pain signals in the CNS, thereby exerting its analgesic effects. Use of intrathecal magnesium sulphate is associated with better intraoperative analgesia and lesser post operative opioid use.[19,20,21]

We conducted a prospective randomized controlled trial to compare efficacy of magnesium sulphate and fentanyl as adjuvants to intrathecal

0.75% hyperbaric ropivacaine to study the onset and duration of motor and sensory block and their effect on hemodynamic profile of the patients.

AIMS AND OBJECTIVES

To assess:

1. Safety and efficacy of drugs in terms of onset and duration of sensory and motor block
2. Intraoperative and postoperative hemodynamic changes
3. Adverse reaction, if any

REVIEW OF LITERATURE

ROPIVACAINE

Ropivacaine is a newly developed, long-acting amide local anesthetic that exists as a pure S-enantiomer. It has moderate onset of action owing to a high pKa of 8.07. Ropivacaine has a shorter molecular structure with fewer carbon atoms compared to traditionally used bupivacaine, which contributes to its lower lipid solubility. Ropivacaine is metabolized by liver to form 3-hydroxy ropivacaine which is then excreted in urine. Its half life is 120 mins.[3]

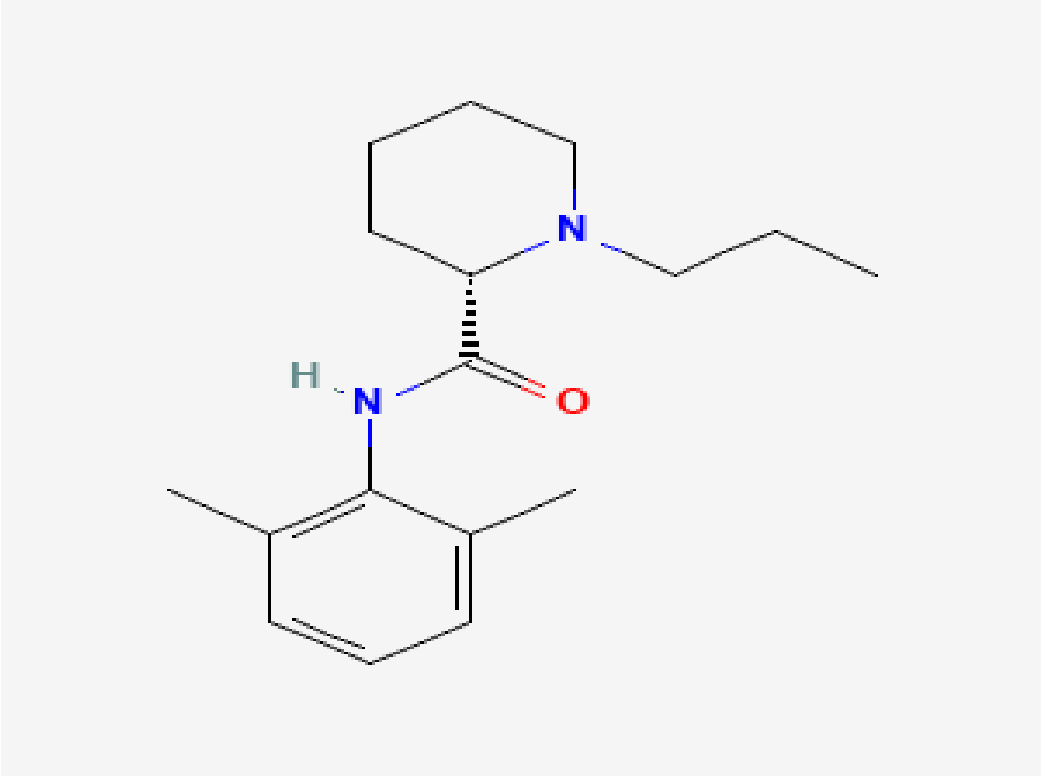


FIGURE 1: STRUCTURE OF ROPIVACAINE

National Center for Biotechnology Information (2024). PubChem Compound Summary for CID 175805,Ropivacaine. Retrieved July 8, 2024from https://pubchem.ncbi.nlm.nih.gov/compound/Ropivacaine.[22]

Ropivacaine works by reversibly inhibiting sodium ion influx, thereby blocking nerve impulse conduction. It is less lipophilic compared to bupivacaine, which reduces its ability to penetrate large myelinated motor fibers. As a result, ropivacaine selectively targets pain-transmitting Aδ and C nerves rather than Aβ fibers, which are primarily involved in motor functions [5]

Ropivacaine exhibits lower cardiotoxicity and CNS toxicity compared to bupivacaine with very less affinity for cardiac Na^+ channels and early dissociation from the channels avoiding any cadiac side-effects as seen in bupivacaine. Selander D et al observed that among 3000 patients across 60 clinical trials done on epidural and major nerve blocks, 6 patients developed neurotoxicity and none of them developed cardiotoxicity. Their findings indicated that accidental intravenous injection of ropivacaine resulted in anticipated CNS symptoms with overall incidence of 0.2%, but did not show clear signs of cardiotoxic effects.[23,24]

INTRATHECAL ROPIVACAINE

Ropivacaine has been used as either epidural infusion for caesarean section and hip and lower limb surgeries or as peripheral nerve blocking agent for anaesthesia and analgesia. Studies comparing identical doses of isobaric ropivacaine and bupivacaine have shown that ropivacaine has similar efficacy but results in shorter durations of sensory and motor block. The initial isobaric formulation of ropivacaine provided unpredictable and unreliable block and hence was its intrathecal use became limited. That led to introduction of hyperbaric preparation of the drug for intrathecal use. It is required in a ratio of 1.5:1 on mg to mg basis compared to bupivacaine for achieving spinal blockade similar to bupivacaine.[24,25] [26]

In a randomized controlled trial conducted by Erturk et al. with geriatric patients undergoing hip arthroplasty, the effects of ropivacaine (12 mg

with 20 mcg fentanyl, group R) were compared to hyperbaric bupivacaine (8 mg with 20 mcg fentanyl, group B). The study found no significant differences between the groups in terms of the onset and extent of sensory block at T10, as well as the time to maximum spread and regression of sensory block. However, ropivacaine demonstrated faster regression at T10 ($P<0.0167$) and a shorter total duration of sensory block ($P<0.0167$). Patients in the ropivacaine group also experienced quicker recovery from motor block ($P<0.0167$) and shorter times to independent mobilization ($P<0.0167$). The study concluded that ropivacaine induces less motor block and fewer hemodynamic side effects compared to bupivacaine.[27]

Khalil RS et al did a meta analysis of 33 research papers from 1980 to 2023 to compare incidence of hypotension in patients undergoing spinal anaesthesia with either ropivacaine or bupivacaine. They also compared duration of sensory block, duration of motor block, incidence of bradycardia, ephedrine usage, and duration of analgesia in both groups. After reviewing all the relevant literature they observed that the incidence of hypotension was notably higher with intrathecal bupivacaine compared to ropivacaine ($P = 0.02$). Intrathecal bupivacaine also resulted in prolonged durations of sensory block ($P < 0.001$) and motor block ($P < 0.001$) and provided longer analgesic duration ($P = 0.003$).They concluded that although incidence of hypotension was lesser with intrathecal ropivacaine, the sensory block it produced was of relatively shorter duration.[28]

ROLE OF ADJUVANTS WITH INTRATHECAL ROPIVACAINE

To address the lesser duration of sensory block and analgesia provided by Ropivacaine various adjuvants can be combined with it intrathecally. These additional agents serve multiple purposes: extending the duration of anesthesia, thereby reducing the required dose of local anesthetic for

effective block, and enhancing the analgesic effects of the anesthetic itself.

Opioids are frequently used as adjuncts to intrathecal local anesthetics, and several studies have investigated the effectiveness of combining intrathecal ropivacaine with fentanyl. Chan JC et al conducted a randomized controlled trial to assess the impact of adding intrathecal fentanyl to ropivacaine for cesarean deliveries. They enrolled 59 healthy, full-term parturients scheduled for elective cesarean section under spinal anesthesia. Participants were randomly assigned in a double-blind manner to receive either fentanyl 10 mcg or normal saline 0.2 ml added to 18 mg of 0.5% hyperbaric ropivacaine. The study evaluated characteristics of spinal block, the quality of intraoperative anesthesia, side effects, time to first sensation of pain (complete analgesia), and time to first request for analgesics (effective analgesia). The findings indicated that the duration of sensory block was significantly prolonged in the fentanyl group (P<.05), while the duration of motor block was comparable between the groups. Intraoperative analgesia quality was notably better in the fentanyl group (P<.05), and there were no significant differences in side effects between the groups. Importantly, the fentanyl group experienced prolonged durations of complete analgesia (143.2 +/- 34.2 minutes vs. 101.4 +/- 21.4 minutes; P<.001) and effective analgesia (207.2 +/- 32.2 minutes vs. 136.3 +/- 14.1 minutes; P<.001). The study concluded that adding 10 mcg of fentanyl to 18 mg of hyperbaric ropivacaine for spinal anesthesia in cesarean deliveries enhances intraoperative anesthesia and extends analgesia into the early postoperative period.[29]

Bathari R et al conducted a randomized controlled trial to compare the effects of adding fentanyl or clonidine to intrathecal hyperbaric ropivacaine. Sixty ASA I and II patients were randomly assigned to receive

spinal anesthesia with hyperbaric ropivacaine alone (group R), ropivacaine with clonidine (group RC), or ropivacaine with fentanyl (group RF). The study found that the three groups were similar in terms of the mean time to onset of sensory block at T10, the height of block, and the time to reach maximum block. However, sensory regression to S2 occurred later in groups RF and RC compared to group R ($p=0.001$ and $p<0.01$, respectively). The time until rescue analgesia was needed was also longer in groups RF and RC compared to group R ($p=0.023$ and 0.002, respectively). Furthermore, group RC exhibited longer times for complete regression of motor block and time to voiding compared to group R ($p=0.022$ and $p=0.013$, respectively). Based on these findings, the study concluded that adding 30 mcg of fentanyl to hyperbaric ropivacaine may offer advantages over adding 15 mcg of clonidine, especially for knee arthroscopy, as it provides a similar prolongation of sensory block and analgesia without extending motor block duration or delaying time to urination.[30]

Gupta K et al conducted a prospective study to investigate the effects of intrathecal fentanyl as an adjunct to 0.75% isobaric ropivacaine for infraumbilical surgery under subarachnoid block. They enrolled 160 adult patients of ASA I and II, scheduled for infraumbilical surgery, which were randomly divided into two groups of 80 each. Patients received either 4 ml of 0.75% ropivacaine with 0.4 ml of 0.9% sodium chloride intrathecally. The study concluded that intrathecal fentanyl accelerated the onset time to achieve sensory blockade up to the T10 dermatome and motor blockade. Even with a small dose, intrathecal fentanyl extended the duration of analgesia in the early postoperative period compared to intrathecal ropivacaine alone. Intraoperative hemodynamic variability did not show statistically significant differences between the groups. The mean onset time for adequate sensory analgesia at the T10 dermatome was 3.2 ± 1 min in Group I (fentanyl group) and 3.5 ± 1 min in Group II (ropivacaine

alone). The mean time to reach the highest level of T6 for sensory blockade was 9.8 ± 3.2 min in Group I and 8.13 ± 1.92 min in Group II, with no statistically significant difference observed.[12]

SIDE EFFECTS ASSOCIATED WITH INTRATHECAL USE OF OPIOIDS

Various side effects are associated with the use of intrathecal opioids, such as nausea, vomiting, pruritus, urinary retention, and respiratory depression.

Ali MA et al conducted a prospective randomized double-blind study involving 243 parturients undergoing cesarean section under spinal anesthesia. They were randomly assigned to receive 10, 15, or 25 mcg of intrathecal fentanyl in combination with 10 mg of 0.5% hyperbaric bupivacaine. The study assessed side effects including pruritus, nausea, vomiting, dizziness, and changes in saturation and respiratory rate. Patients who received 25 mcg of fentanyl experienced a significantly higher incidence of pruritus, nausea, and dizziness, as well as a prolonged sensory and motor block ($P<0.001$). Despite these effects, all groups achieved adequate surgical anesthesia with no statistically significant differences in the onset of block, quality of surgical anesthesia, pain scores, neonatal APGAR score, hemodynamic variables, or the need for vasopressors.[15]

Weigl W et al conducted a randomized controlled study focusing on perioperative analgesia in cesarean sections using intrathecal fentanyl and morphine or morphine alone. The study involved 60 parturients scheduled for elective caesarean section. Spinal anesthesia was administered with either bupivacaine combined with morphine 100 mcg (M group) or with fentanyl 25 mcg or morphine 100 mcg (FM group). The study recorded the frequency of intraoperative pain and the consumption of pethidine in the 24 hours postoperatively. They found that fewer

patients in the FM group required additional intraoperative analgesia (P<.01, relative risk 0.06, 95% confidence interval [CI] 0.004-1.04). The FM group showed non-inferiority to the M group in terms of 24-hour opioid consumption (95% CI -10.0mg to 45.7mg, below the predefined boundary of 50mg). Pethidine consumption in the first 12 postoperative hours was significantly higher in the FM group (P=.02). Postoperative nausea and vomiting (PONV) were more frequent in the FM group (P=.01). Visual analog scale scores, effective analgesia, APGAR scores, and incidences of pruritus and respiratory depression were similar between the two groups. The authors concluded that the combination of intrathecal fentanyl and morphine may offer superior perioperative analgesia compared to morphine alone in cesarean sections, particularly when there is a need for rapid onset from anesthesia to skin incision. However, they highlighted the increased incidence of PONV and the potential for acute spinal opioid tolerance with the use of intrathecal fentanyl, suggesting that further investigation is warranted, particularly focusing on lower doses of fentanyl.[31]

MAGNESIUM SULPHATE

Magnesium sulphate is a non-opioid drug frequently employed as an adjuvant to local anesthetics in intrathecal blocks. Its mechanism of action involves antagonizing NMDA receptors non competitively located in the dorsal horn of the spinal cord, effectively blocking pain signals. It also block voltage gated N-type calcium channels. Unlike opioids such as fentanyl, magnesium sulphate does not induce side effects such as pruritus, nausea, vomiting, or respiratory depression. After the discovery of NMDA receptor and its association with nociceptive pain transmission and central sensitization, noncompetitive NMDA receptor antagonists like magnesium sulphate and ketamine have extensively been studied for their use in human subjects

In a meta-analysis by J. Pascual-Ramírez et al., researchers reviewed twelve randomized clinical trials involving 817 patients undergoing below-umbilicus procedures. They compared the effects of adding 50 to 100 mg of intrathecal magnesium sulfate to placebo, alongside local anesthetics and/or opioids. The study found that including intrathecal magnesium sulfate significantly prolonged the "time to first analgesia request" by at least 35 minutes (Standardized Mean Difference [SDM] 0.94, 95% Confidence Interval [CI] 0.51 to 1.37, P<0.001). However, it also delayed the "onset time to sensory block" (SDM 0.64, 95% CI 0.15 to 1.12, P=0.01) and the "time to maximal motor block" (SDM 0.97, 95% CI 0.28 to 1.67, P=0.006) by approximately 2.4 minutes each. Importantly, there was no significant difference observed in "time to full motor recovery," nor in the incidence of common side effects such as pruritus, postoperative nausea and vomiting, bradycardia, low blood pressure, or urinary retention. Furthermore, no cases of respiratory depression or neurotoxicity were reported across these studies. In conclusion, the meta-analysis suggests that adding 50 to 100 mg of intrathecal magnesium sulphate to spinal anesthesia effectively extends the duration of opiate analgesia without increasing the risk of major adverse effects.[32]

Katiyar S. et al conducted an RCT on 120 ASA I and II patients posted for infraumblical surgeries under spinal anaesthesia. They compared two different doses of $MgSO_4$ with fentanyl when added to intrathecal bupivacaine. Patients were divided into four groups A, B, C and D and were administered fentanyl 25 mcg, $MgSO_4$ 100 mg, $MgSO_4$ 50 mg and N.S 0.5ml respectively along with 3 ml of 0.5% hyperbaric bupivacaine. They observed that when $MgSO_4$ was given in dose of 100mg, the duration analgesia was prolonged as compared to 50 mg and was comparable with fentanyl 25 mcg. They also observed better hemodynamic profile with magnesium and lesser side effects.[33]

Paleti S et al conducted a randomized clinical trial comparing intrathecal magnesium sulphate versus midazolam in combination with epidural ropivacaine for patients with preeclampsia undergoing elective cesarean section. Fifty pre-eclamptic parturients were randomly assigned to receive either intrathecal magnesium sulphate (50 mg) or intrathecal midazolam (1 mg) alongside epidural ropivacaine (0.75%; 14-16 ml). They evaluated the onset and duration of sensory and motor blockade, duration of postoperative analgesia, postoperative pain scores using visual analogue scales, and perioperative side effects. The study found that midazolam had faster onset times for sensory and motor blockade compared to magnesium sulphate ($P<0.01$). However, the duration of sensory and motor blockade and time to first request for analgesia were significantly longer in the magnesium group compared to the midazolam group ($P<0.01$). The authors concluded that intrathecal magnesium sulphate with epidural ropivacaine significantly prolonged postoperative analgesia compared to intrathecal midazolam, without any observed complications.[34]

Deepa T et al conducted a prospective randomized double-blind parallel-group study to compare the effect of adding intrathecal magnesium sulfate to 0.5% hyperbaric bupivacaine and 0.5% isobaric levobupivacaine on the duration of analgesia in parturients undergoing elective caesarean section. They found that the duration of analgesia did not differ significantly between the two groups ($P=0.175$). Sensory onset time was faster in group I (3.5 ± 1.3 min) compared to group II (4.8 ± 2 min; $P=0.004$). The onset of motor blockade did not differ between the groups ($P=0.265$), but there was a significant delay ($P=0.002$) in motor recovery in group II (267 ± 130.6 min) compared to group I (225 ± 85.4 min). Hemodynamics were comparable between the two groups.[35]

In a prospective, randomized, double-blind, comparative study done by S. Saxsena et al on 60 ASA I and II patients undergoing lower abdomen surgeries under spinal anaesthesia, they divided them into two groups (R and R+M). Group R received spinal anesthesia with 3ml of 0.6% hyperbaric ropivacaine (18mg) + 0.5ml NS hyperbaric ropivacaine and Group R+M received spinal anesthesia with 3ml of 0.6% hyperbaric ropivacaine (18mg) + 0.5ml magnesium sulphate (50 mg). It was observed that two segment regression time and motor recovery was prolonged in Group R+M than in Group R. Aslo the complications were lower when magnesium was added to intrathecal ropivacaine.[36]

S. Srikanth et al used 75 mg of magnesium sulphate and compared block charaterstics of intrathecal hyperbaric ropivacaine when given alone and when given with 75 mg $MgSO_4$. They enrolled 80 ASA I and II patients and divided them in two groups of 40 each. One group was administered 3ml of hyperbaric ropivacaine with 75 mg magnesium and the other group was administerd 3ml of hyperbaric ropivcacaine and 0.75ml sterile water. It was concluded that adding intrathecal magnesium to hyperbaric ropivacaine significantly extended the duration of sensory blockade and the post-operative pain-free period without causing an increase in the duration of motor blockade or the occurrence of adverse effects.[37]

MATERIAL & METHODS

SOURCE OF DATA

After approval from the institutional ethical committee, this randomized controlled double-blind study was conducted in the Department of Anaesthesiology at DMCH, Ludhiana. Sixty patients with ASA grade I and II, aged 18 and above, undergoing elective lower abdominal surgeries under subarachnoid block, were included after obtaining written informed consent

METHOD OF COLLECTION OF DATA

INCLUSION CRITERIA-

- ASA I and ll
- Age 18 and above
- Either gender

EXCLUSION CRITERIA-

- Patients who have not consented to undergo spinal anesthesia.
- Patients who were allergic to the drugs being used.
- Patients for whom spinal anaesthesia was contraindicated

GROUP ALLOCATION: Patients selected for the study were randomly assigned to two groups using computer-generated numbers enclosed in sequentially numbered envelopes.

Group F - Patients in this group were administered 2.5 ml of 0.75% hyperbaric ropivacaine plus 0.5 ml of fentanyl (25 mcg) to make a total volume of 3 ml.

Group M Patients in this group were administered 2.5ml of 0.75% hyperbaric ropivacaine, 0.2ml of magnesium sulphate (100mg), and 0.3ml of distilled water to make a total volume of 3ml.

PREANAESTHETIC CHECK-UP

All the patients underwent a thorough pre-anesthetic checkup one day before the procedure, which included a detailed systemic history and examination. Preoperative investigations, including complete blood count, PT-INR, renal function test, serum electrolytes, chest X-ray, and electrocardiogram, were performed as needed. Patients' hemodynamic parameters, such as blood pressure, pulse rate, respiratory rate, and oxygen saturation (SpO2), were assessed the day before the procedure. The patients were instructed to fast for 8 hours before the surgery. Intravenous fluids were started at a maintenance rate once the patient was kept NPO. Tablet Pantoprazole 40 mg and Tablet Alprazolam 0.25mg were administered at midnight and at 6 a.m. on the day of surgery. Immediately after pre-induction evaluation patients were shifted to the operation theatre, on the day of surgery.

ANAESTHESIA TECHNIQUE

After the patient was shifted to the operating table, pre-induction monitors were attached to the patient to record heart rate, non-invasive blood pressure, oxygen saturation, and electrocardiogram. An 18G cannula was used to secure an intravenous line, and intravenous crystalloids were started. Three readings of HR, NIBP, and SpO2 were taken, and the average of the three readings was used as the baseline for vital parameters. Patients were positioned with their backs exposed. Under aseptic precautions, the back was cleaned and draped. Then, the L3-L4 intervertebral space was palpated. 2 ml of 2% lidocaine was locally infiltrated into the palpated area. A 26-gauge Quincke needle was then inserted into the space. After confirming the free flow of CSF, the drug mixture was injected into the space following the loss of resistance to needle insertion.

The drug mixture to be administered was determined by sealed envelopes prepared by an individual not involved in the research. The anaesthesiologist in the operating theatre opened the envelope. After administering the drug into the subarachnoid space, the patient was positioned in the supine position.

Onset and duration of sensory and motor block and monitoring of PR, NIBP (systolic, diastolic, and mean), ECG, and SpO2 was recorded by the attending anaesthesiologist during the surgery. After surgery, the patient was shifted to recovery room.

OBSERVATION

The onset of sensory block was assessed using a sterile pinprick method starting from below to above every 5 min and was taken as the point of time at which patient was unable to feel the pinprick at the T8 level. After that, the level was assessed every 15 minutes. The duration of the sensory block was measured as the time of regression of two segments in maximum block height. The onset of motor block was taken as the time to reach a modified Bromage score of 3 after the intrathecal injection of the drug.

MODIFIED BROMAGE SCORE

0. Free movement of legs and feet.
1. Unable to raise extended legs but able to Flex knees with free movement of feet.
2. Unable to flex knees but with free movement of feet.
3. Unable to move legs and feet.

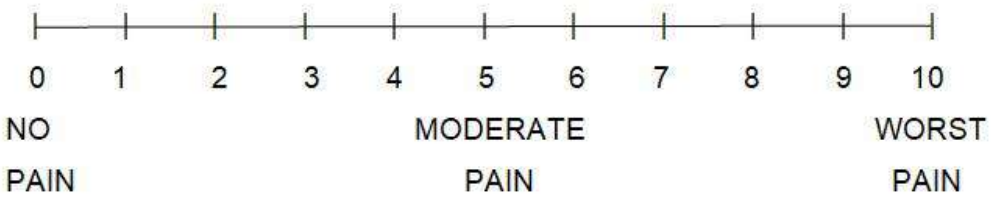
Duration of motor block was measured from onset to modified bromage score of 0. Patients with failed subarachnoid block were excluded from the study.

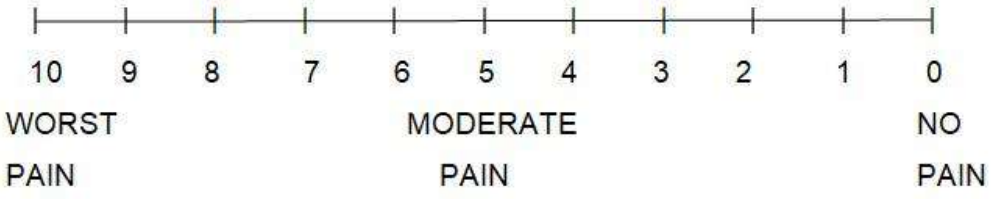
INTRAOPERATIVE ASSESSMENT

The sensory block was measured at 0, 5, 10, and 15 minutes after the intrathecal injection and then every 15 minutes thereafter. The highest level of sensory block was measured by pinprick at the midclavicular line anteriorly every 5 minutes for the first 15 minutes and then every 15 minutes until 90 minutes. Motor block was recorded at 0, 5, 10, and 15 minutes, and then every 15 minutes until 90 minutes. Hemodynamic parameters (HR, NIBP - systolic, diastolic, and mean, and $SpO_{2)}$ of the patient were recorded every minute for the first 5 minutes, and then every 5 minutes until 90 minutes. Hypotension was defined as a drop in systolic blood pressure of more than 20% from baseline or systolic blood pressure of less than 90 mmHg. It was managed with an intravenous injection of 6 mg of ephedrine, rapid IV fluid infusion, and oxygen supplementation. Bradycardia was defined as a heart rate of less than 60 beats per minute and was managed with an intravenous injection of 0.6 mg of atropine.

POSTOPERATIVE ASSESSMENT

Immediately after transferring the patient to the recovery room, heart rate (HR), non-invasive blood pressure (NIBP), including systolic, diastolic, and mean, respiratory rate, and SpO2 were recorded every 15 minutes for the first 60 minutes, and then hourly for the next 6 hours. The quality of postoperative analgesia was assessed using the Visual Analogue Scale (ranging from 0 indicating no pain to 10 indicating severe, intolerable pain), which was explained to the patient preoperatively.





VAS scores were recorded at 0, 2, 4, and 6 hours postoperatively. Patients with a VAS score of 4 or more were given an intravenous injection of 50mg of Tramadol slowly. Any postoperative complications requiring intervention were also recorded. The total amount of additional pain relief needed for each patient was documented. Postoperatively , the sensory and motor block levels were recorded every 15 minutes for the first 60 minutes, every 30 minutes until the third hour, and then hourly until the end of the sixth hour. Patients were discharged from the recovery room after complete resolution of motor block.

OUTCOME:

PRIMARY OUTCOME:

Onset and duration of sensory block and motor block

SECONDARY OUTCOME:

Hemodynamic parameters:

Systolic Blood Pressure (SBP), Diastolic Blood Pressure (DBP), Peripheral Oxygen Saturation (SpO_2), and Mean Arterial Pressure (MAP)

SAMPLE SIZE CALCULATION

The formula used was as under:

$n = (\sigma 12 + \sigma 22) (Z\alpha + Z\beta)^2/(m1 – m2)^2$

Where,

Zα = Value of standard normal variate corresponding to α level of significance (1.96)

Zβ = The standard normal deviate for desired power (0.842)

m = Average

σ = Standard deviation

Assumptions:

From the study conducted by Ronald Bathari et al

Mean Group (m1) = 128.2

Mean Group (m2) = 156

Coefficient of variation = 150%

Standard deviation Group (σ1) = 24.9

Standard deviation (σ2) = 42.4

With the above assumptions the sample size for 95% confidence level & 80% power works out 25 in each group. This number was increased to 30 each group to allow for a predicted dropout from treatment.

STATISTICAL ANALYSIS

The continuous variables like age, BMI, duration of surgery, onset and duration of sensory and motor block were described in terms of mean ± standard deviation (SD).

For categorical variables like gender, ASA grade, episodes of hypotension and bradycardia, maximum (highest) level of sensory block, data was described in terms of frequencies (number of cases) and relative frequencies (percentages).

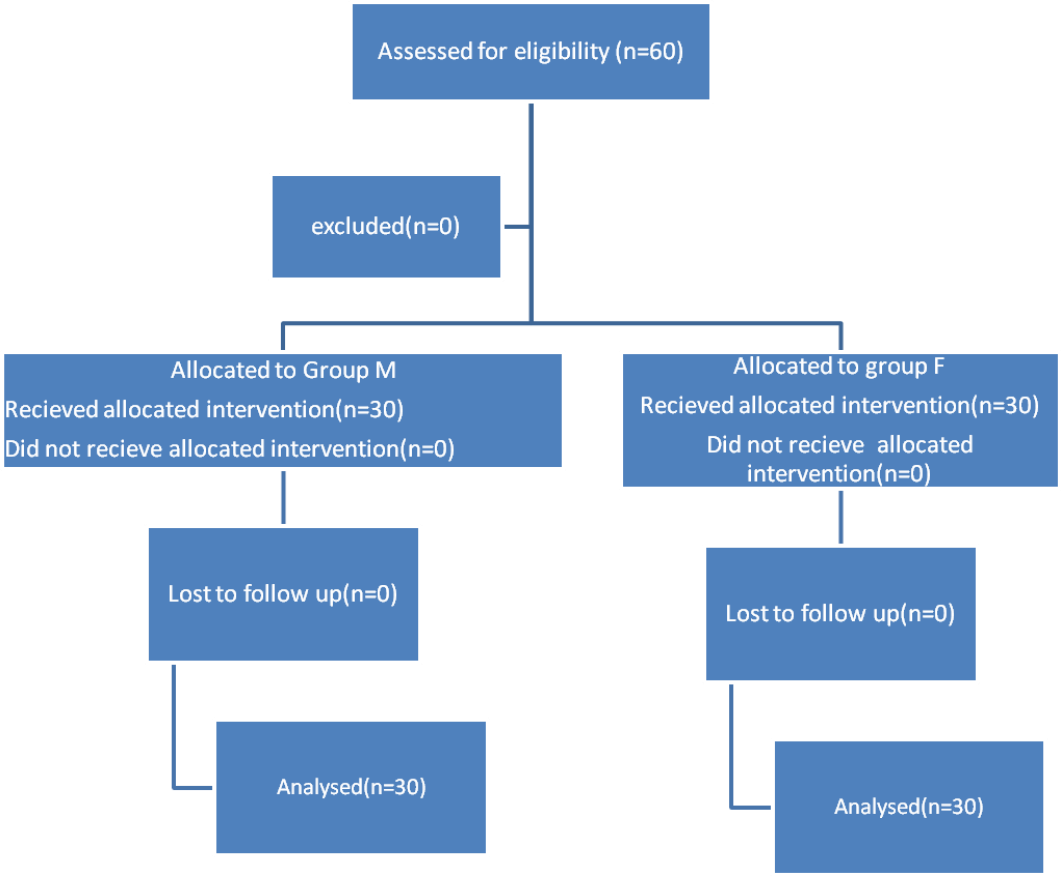
To determine whether the data were normally distributed, a Kolmogorov-Smirnov test was used. For comparison of continuous data between the two study groups i.e. age, BMI, duration of surgery student t-test was used. Z-test was used for comparison of data like time to onset of sensory block, time to maximum (highest) sensory level, duration of sensory block, time to onset of motor block, total duration of motor block, duration of analgesia. For comparing categorical data like gender, comorbidities, ASA grade, episodes of hypotension and bradycardia, maximum (highest) level of sensory block, the side effects associated with the study drugs, Chi square ($\chi 2$) test was performed

All statistical calculations was done using (Statistical Package for the Social Science) SPSS 21version (SPSS Inc., Chicago, IL, USA) statistical program for Microsoft Windows

OBSERVATION AND RESULTS

This prospective RCT was conducted on 60 ASA PS I and II patients in DMC&H Ludhiana. Patients were divided into two groups – Group M (magnesium sulphate) and Group F(Fentanyl)

FIGURE 2: CONSORT FLOW DIAGRAM OF THE STUDY



A total of 60 patients were enrolled for the study according to the inclusion criteria. None of the patients were excluded during the enrollment phase. Sixty patients were randomly allocated to either of the group by computer generated random number and were analyzed after conducting the study. Demographic data was similar in both the groups

TABLE 1: COMPARISON OF STUDY GROUPS ACCORDING TO AGE.

	GROUP F		GROUP M		Z	p-value
	Mean	SD	Mean	SD		
AGE	42.63	14.61	38.10	14.54	-1.132	0.258

The mean age of patients in group F was 42.63 ± 16.61 years and 38.10 ± 14.54 years in group M. There was no statistical difference in the age distribution among two groups (p>0.05)

FIGURE 3: **COMPARISON OF STUDY GROUPS ACCORDING TO AGE.**

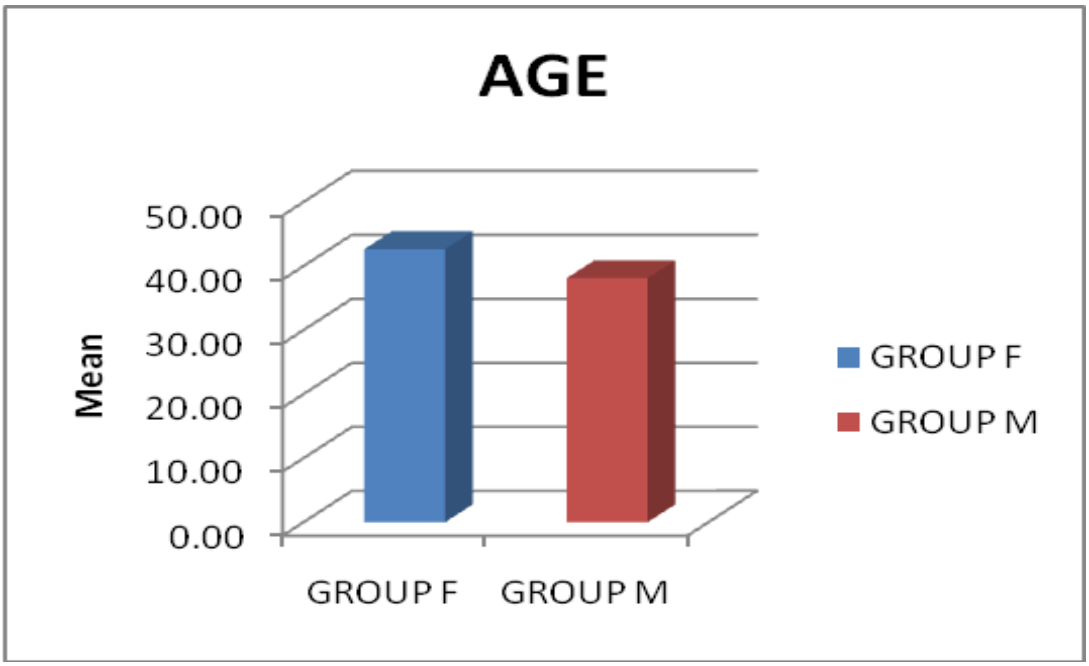


TABLE 2: COMPARISON OF STUDY GROUPS ACCORDING TO GENDER DISTRIBUTION

		GROUP F		GROUP M		Total	Chi-square value	p-value
		No. of cases	%age	No. of cases	%age			
SEX	F	6	20.0%	9	30.0%	15	0.552	0.552
	M	24	80.0%	21	70.0%	45		
Total		30	100.0%	30	100.0%	60		

In Group F, 20.0% of the patients were females and 80.0% were males whereas, in Group M, 30.0% were females and 70.0% were males. The difference between both groups was comparable statistically concerning sex distribution, with a p-value of 0.552.

FIGURE 4: COMPARISON OF STUDY GROUPS ACCORDING TO GENDER DISTRIBUTION

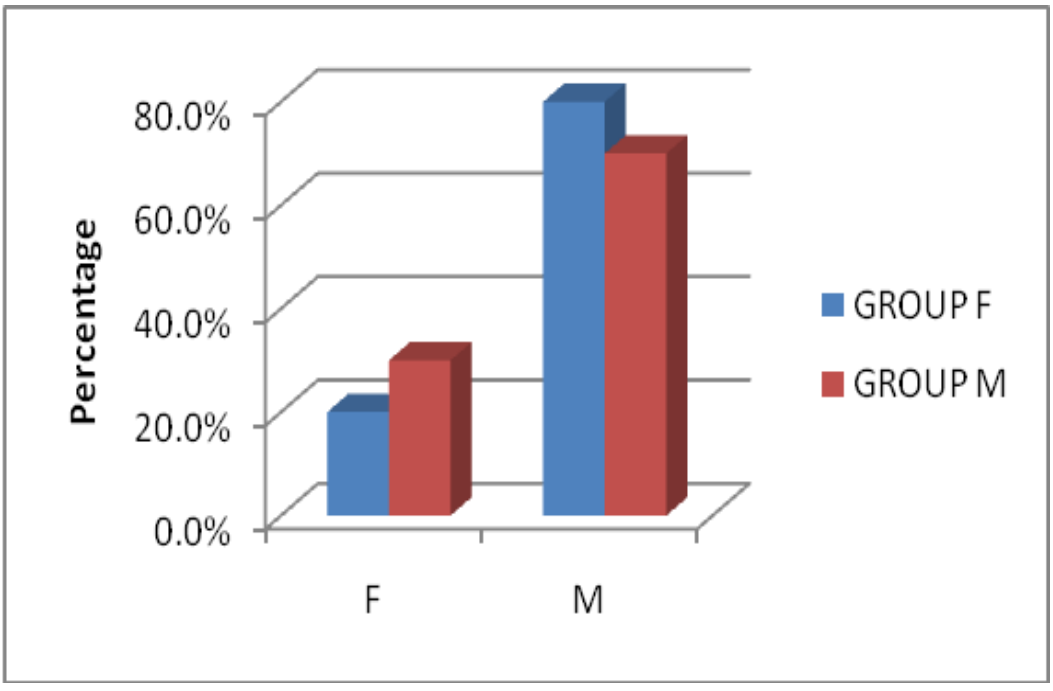


TABLE 3: COMPARISON OF STUDY GROUPS ACCORDING TO BODY MASS INDEX (BMI).

	GROUP F		GROUP M		Z	p-value
	Mean	SD	Mean	SD		
BMI	25.73	4.55	25.45	3.66	-0.399	0.690

The mean BMI of patients in Group F was 25.73 ± 4.55 kg/m^2 and Group M was 25.45 ± 3.66 kg/m^2.There was no statistically significant difference (p-0.690) of mean BMI distribution among patients in both the groups.

FIGURE 5: COMPARISON OF STUDY GROUPS ACCORDING TO BODY MASS INDEX (BMI).

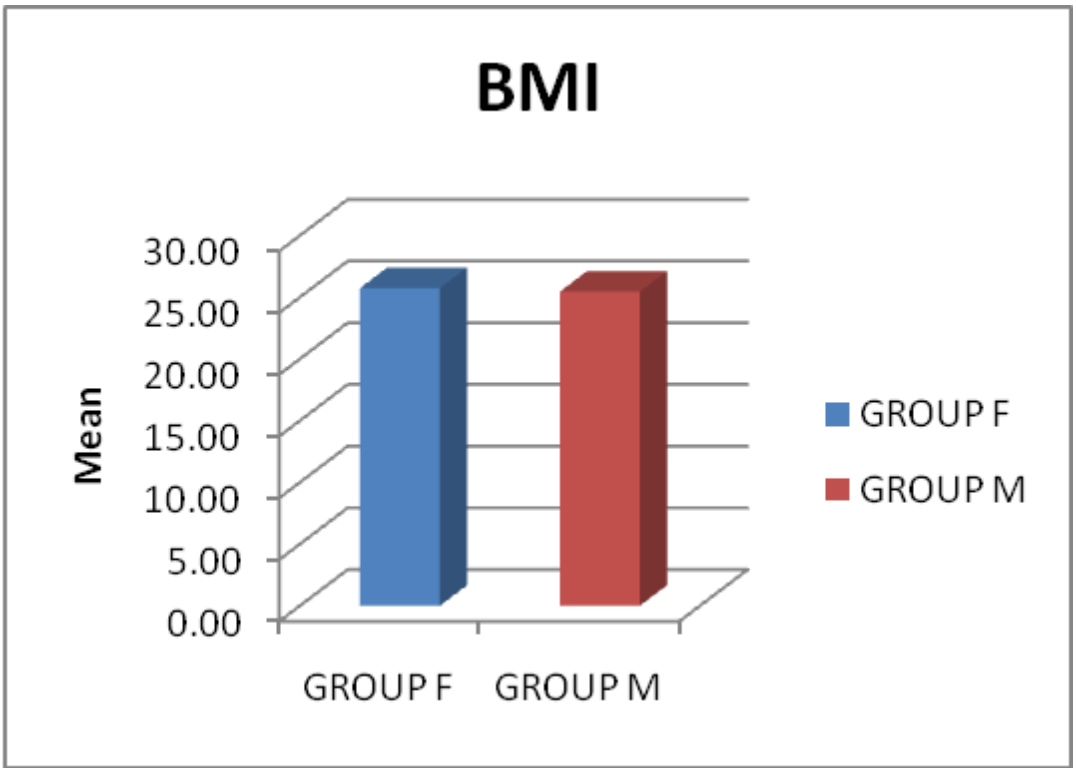


TABLE 4: COMPARISON OF STUDY GROUPS ACCORDING TO ASA GRADE

		GROUP F		GROUP M		Total	Chi-square value	p-value
		No. of cases	%age	No. of cases	%age			
ASA GRADE	1	12	40.0%	17	56.7%	29	1.669	0.301
	2	18	60.0%	13	43.3%	31		
Total		30	100.0%	30	100.0%	60		

In Group F 40% of the patients were ASA grade I, while 60% of the patients were ASA grade II. In Group M 56.7% of the patients were ASA grade I and 43.3% of the patients were ASA grade II. There was no statistically significant difference in both groups in terms of ASA grading.

FIGURE 6: COMPARISON OF STUDY GROUPS ACCORDING TO ASA GRADE

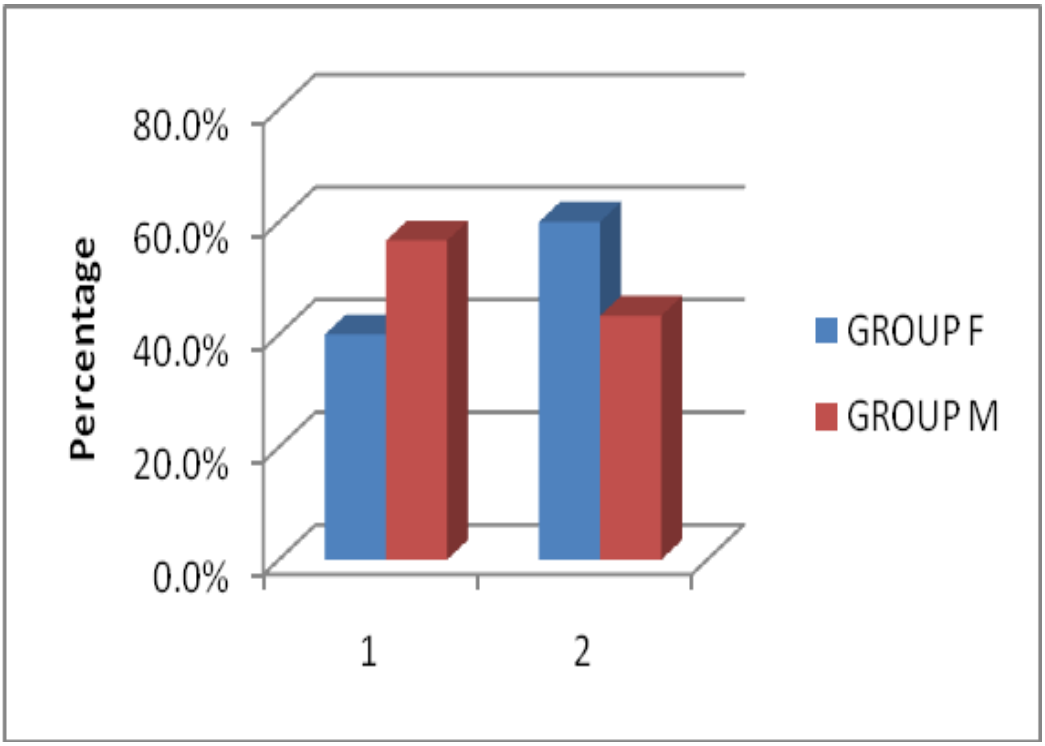


TABLE 5: COMPARISON OF STUDY GROUPS ACCORDING TO ONSET OF SENSORY BLOCK (IN MINUTES)

	GROUP F		GROUP M		Z	p-value
	Mean	SD	Mean	SD		
ONSET OF SENSORY BLOCK	4.10	1.84	6.60	3.38	-3.140	**0.002**

Time to onset of sensory block was 4.10 ± 1.84 mins in Group F, while it was 6.60±3.38 mins in Group M. The difference between both groups was statistically significant with p-value of 0.002.

FIGURE 7: COMPARISON OF STUDY GROUPS ACCORDING TO ONSET OF SENSORY BLOCK (IN MINUTES)

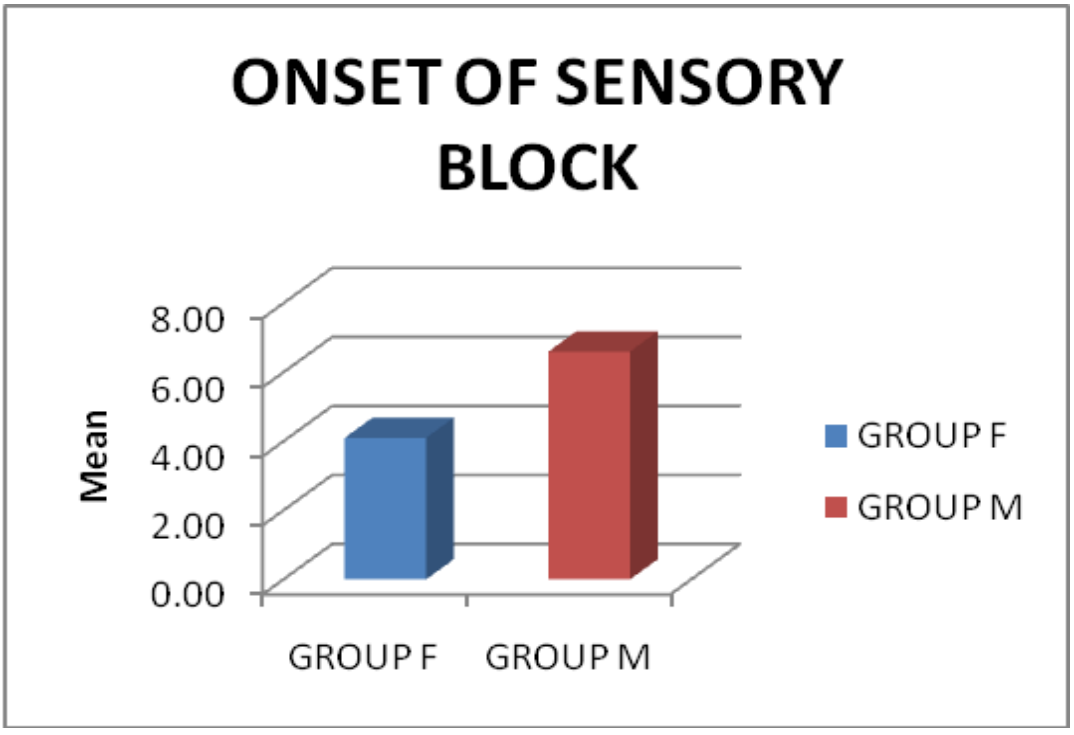


TABLE 6: COMPARISON OF STUDY GROUPS ACCORDING TO DURATION OF SENSORY BLOCK (IN MINUTES)

	GROUP F		GROUP M		Z	p-value
	Mean	SD	Mean	SD		
DURATION OF SENSORY BLOCK	64.17	14.51	71.83	17.49	-1.577	0.115

Mean duration of sensory block was 64.17±14.51 mins for group F and 71.83±17.49 mins in case of group M. The difference between both groups in term of duration of sensory block was statistically insignificant (p-value>0.05).

FIGURE 8: COMPARISON OF STUDY GROUPS ACCORDING TO DURATION OF SENSORY BLOCK (IN MINUTES)

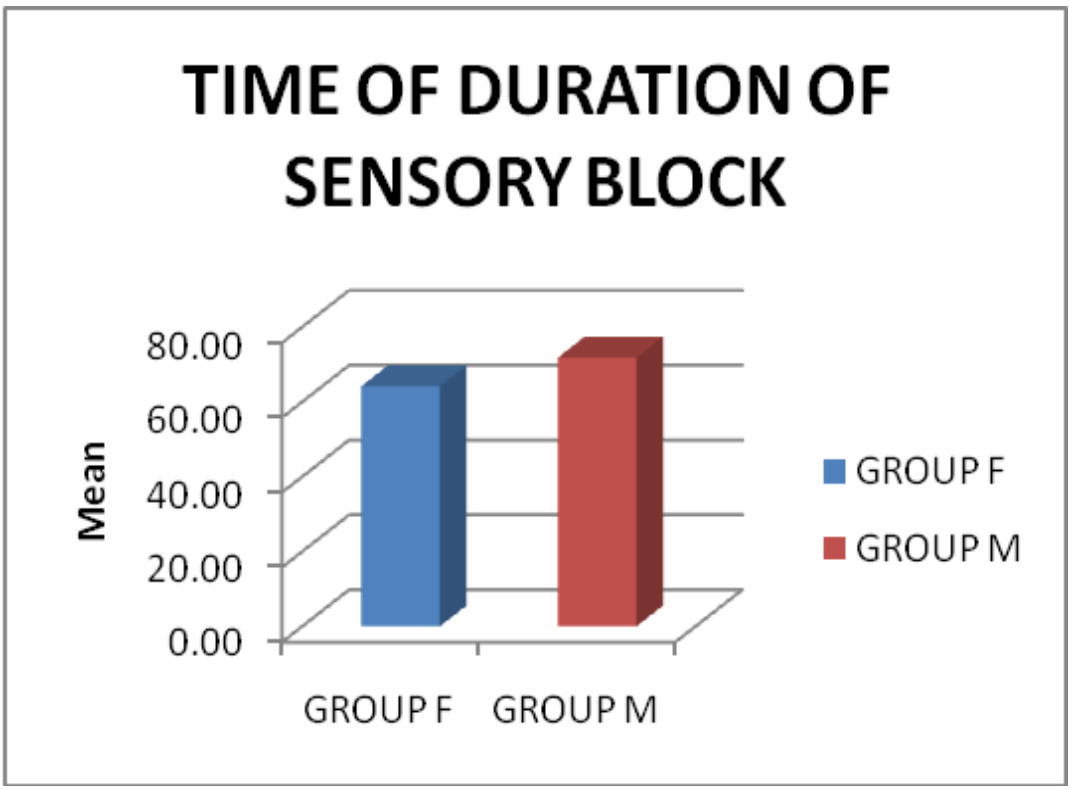


TABLE 7: COMPARISON OF STUDY GROUPS ACCORDING TO TIME REQUIRED TO ACHIEVE MAXIMUM (HIGHEST) LEVEL OF SENSORY BLOCK

	GROUP F		GROUP M		Z	p-value
	Mean	SD	Mean	SD		
TIME TO MAX SENSORY LEVEL	9.97	3.37	13.80	6.51	-2.703	**0.007**

The mean time to attain highest level of sensory block was 9.97±3.37 mins in group F, while it was 13.8±6.1 mins in group M. The difference between two groups was statistically significant with p-value of 0.007

FIGURE 9: COMPARISON OF STUDY GROUPS ACCORDING TO TIME REQUIRED TO ACHIEVE MAXIMUM (HIGHEST) LEVEL OF SENSORY BLOCK

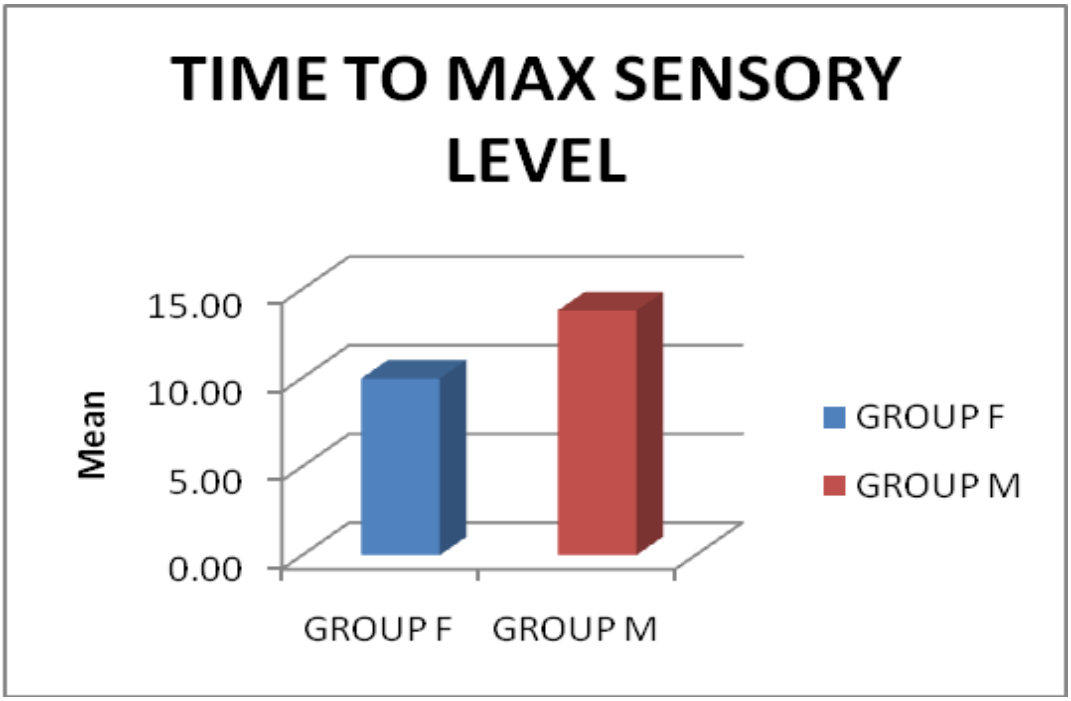


TABLE 8: COMPARISON OF STUDY GROUPS ACCORDING TO MAXIMUM (HIGHEST) SENSORY LEVEL ATTAINED

		GROUP F		GROUP M		Total	Chi-square value	p-value
		No. of cases	%age	No. of cases	%age			
MAX SL	T4	25	83.3%	20	66.7%	45	4.646	0.098
	T6	5	16.7%	6	20.0%	11		
	T8	0	0.0%	4	13.3%	4		

The highest level of sensory block in group F was T4, T6 and T8 in 83.3%, 16.7% and 0% of patients respectively. In group M highest level was T4, T6 and T8 in 66.7%, 20% and 13.3% of patients respectively

FIGURE 10: COMPARISON OF STUDY GROUPS ACCORDING TO MAXIMUM (HIGHEST) SENSORY LEVEL ATTAINED

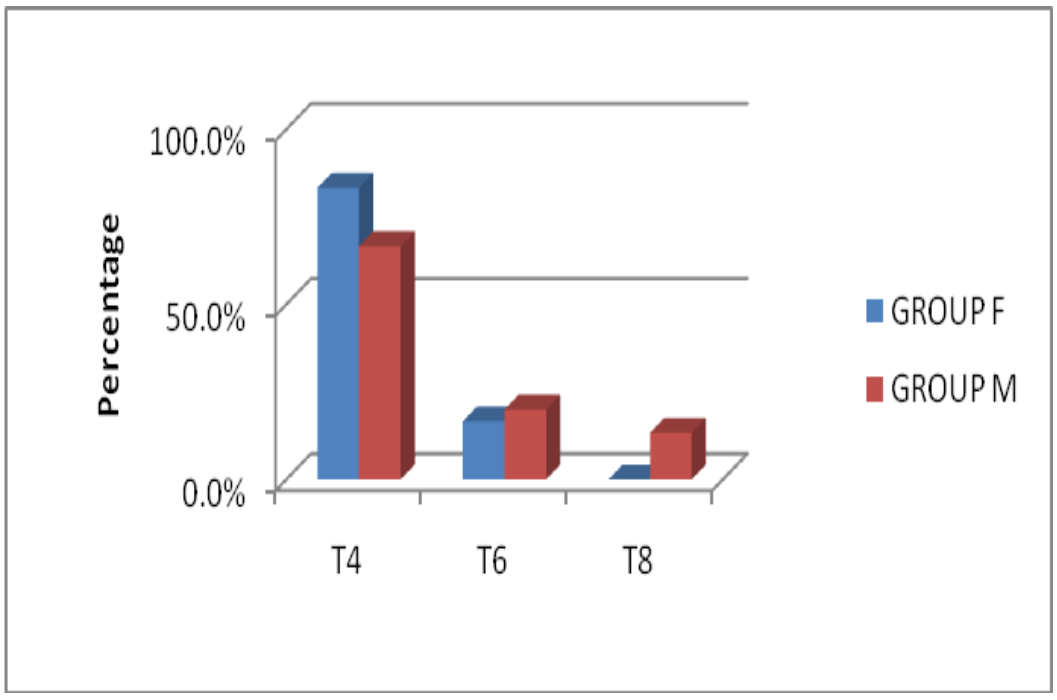


TABLE 9: COMPARISON OF STUDY GROUPS ACCORDING TO TIME REQUIRED FOR ONSET OF MOTOR BLOCK (MINUTES)

	GROUP F		GROUP M		Z	p-value
	Mean	SD	Mean	SD		
ONSET OF MOTOR BLOCK	4.20	2.14	7.87	6.58	-3.484	0.001

For group F, mean time of onset of motor block was 4.20±2.14 mins. While for group M, it was 7.87±6.58mins. The difference was statistically significant (p<0.05)

FIGURE 11: COMPARISON OF STUDY GROUPS ACCORDING TO TIME REQUIRED FOR ONSET OF MOTOR BLOCK (MINUTES)

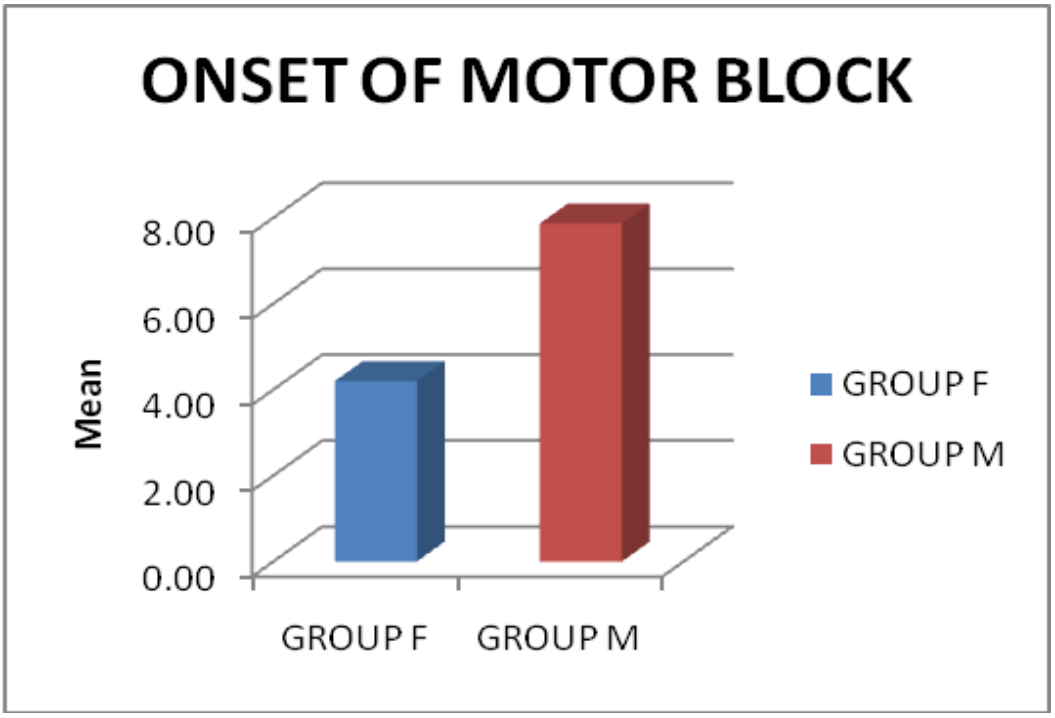


TABLE 10: COMPARISON OF STUDY GROUPS ACCORDING TO DURATION OF MOTOR BLOCK (MINUTES)

	GROUP F		GROUP M		Z	p-value
	Mean	SD	Mean	SD		
DURATION OF MOTOR BLOCK	124.67	25.19	120.83	30.17	-0.341	0.733

The total duration of motor block (in minutes) was relatively less in Group M (120.83 ± 30.17 mins) than in group F (124.67±25.19 mins). The difference between both the study groups was statistically insignificant with a p-value of 0.733

FIGURE 12: COMPARISON OF STUDY GROUPS ACCORDING TO DURATION OF MOTOR BLOCK (MINUTES)

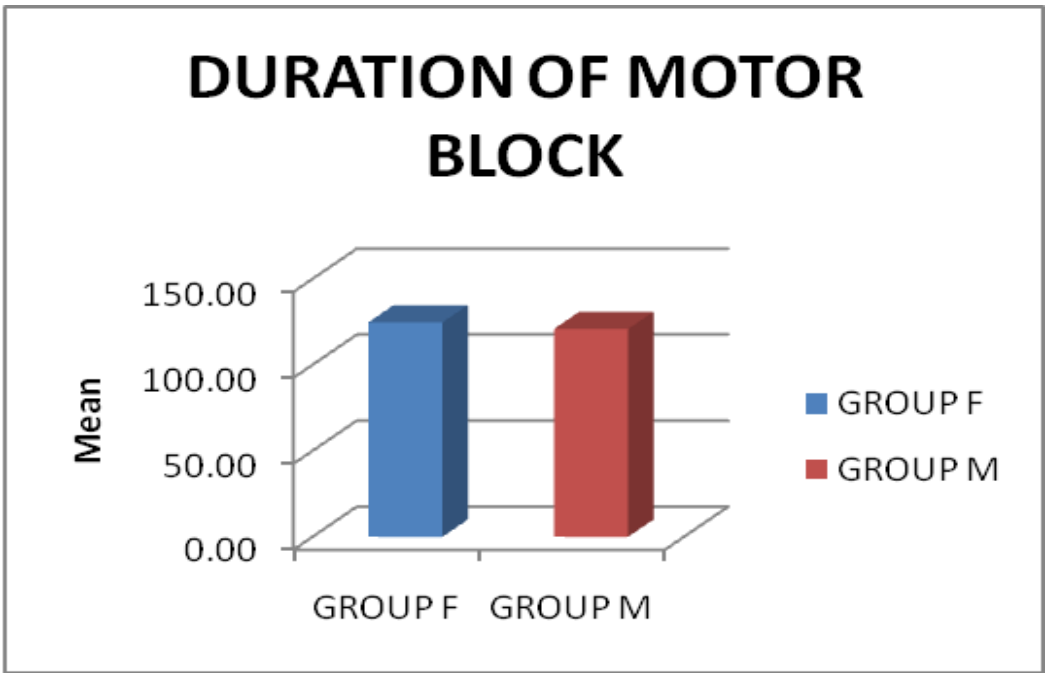


TABLE 11: COMPARISON OF STUDY GROUPS ACCORDING TO DURATION OF ANALGESIA (FIRST RESCUE ANALGESIC IN MINUTES)

	GROUP F		GROUP M		Z	p-value
	Mean	SD	Mean	SD		
DURATION OF ANALGESIA	276.27	69.66	263.73	59.86	-0.281	0.778

The mean duration of analgesia was 276.27 ± 69.66 mins in group F while it was 263.73 ± 59.86 mins in group M. The difference between both groups was statistically insignificant (p-value>0.05)

FIGURE 13: COMPARISON OF STUDY GROUPS ACCORDING TO DURATION OF ANALGESIA (FIRST RESCUE ANALGESIC IN MINUTES)

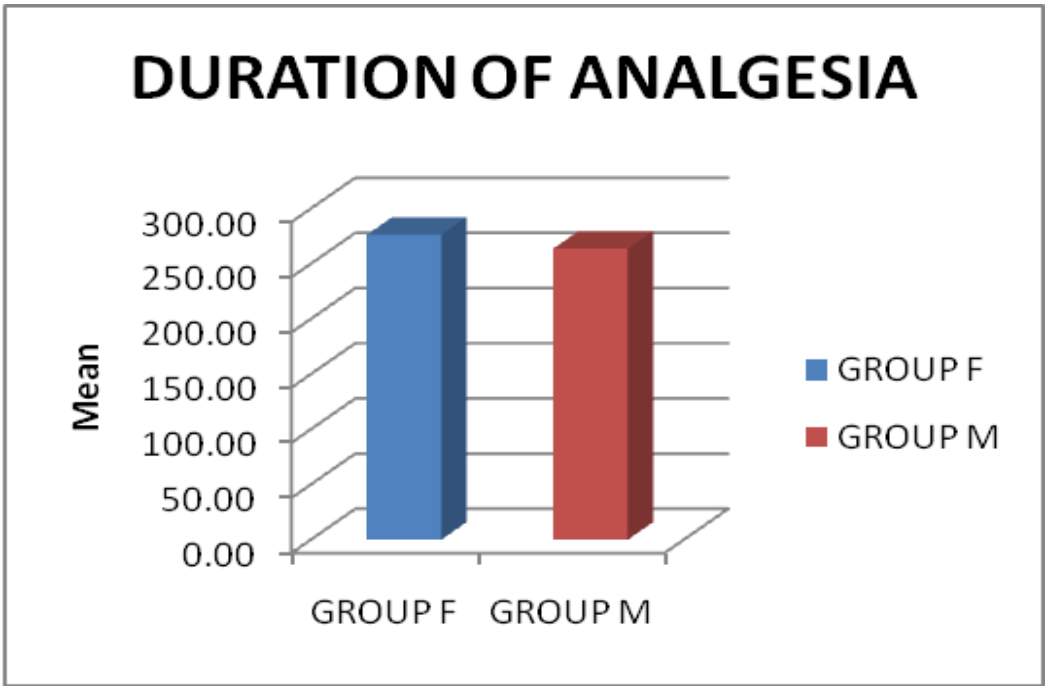
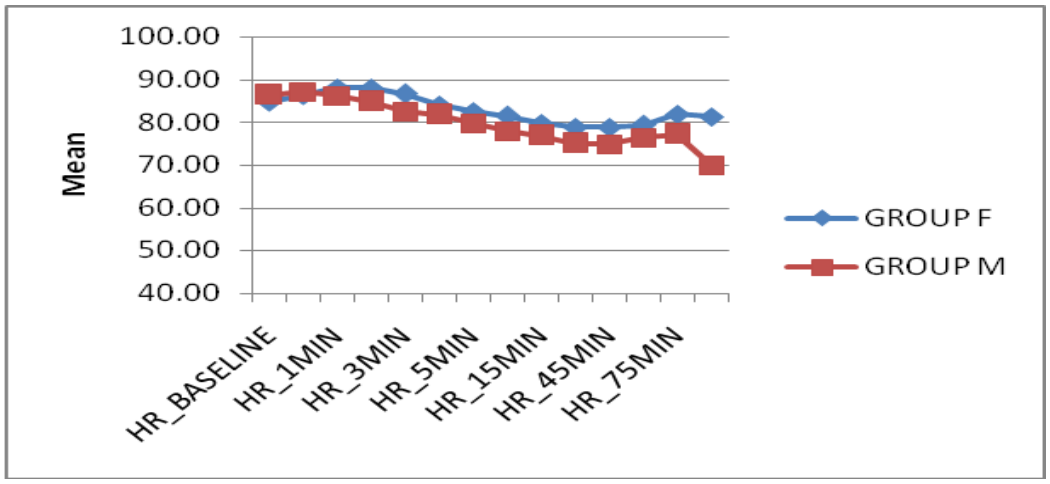
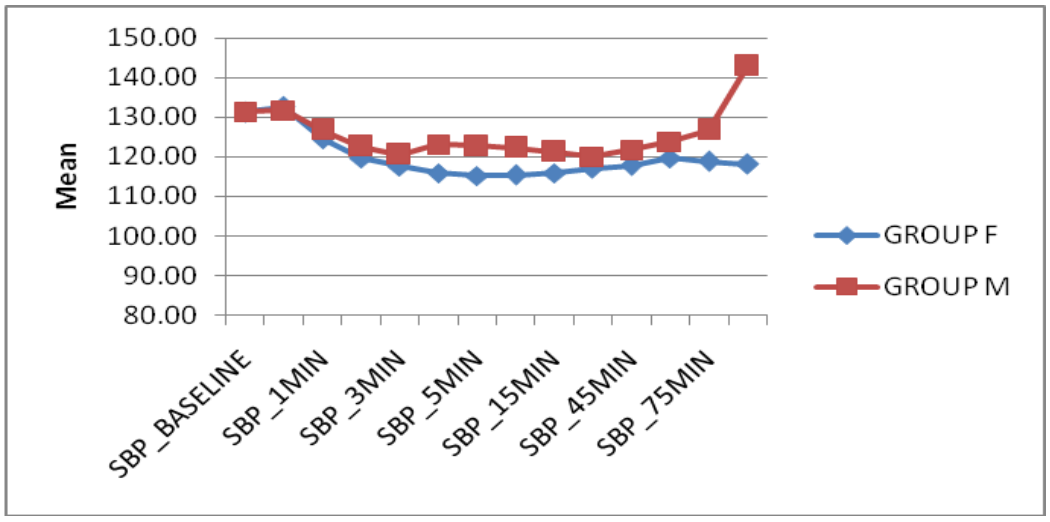


FIGURE 14: TRENDS OF INTRA-OPERATIVE HR VALUES IN BOTH GROUPS



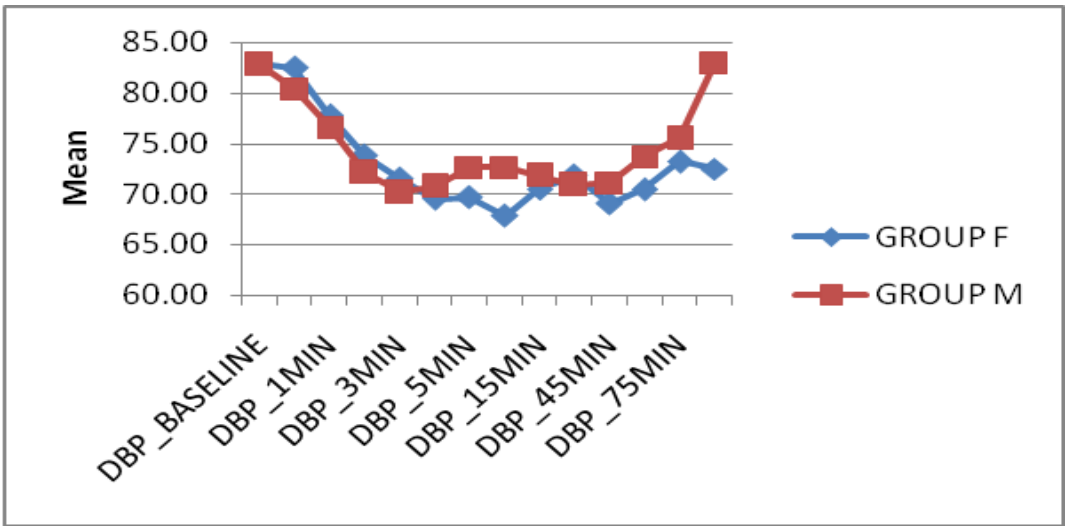
There was no statistically significant difference between the intra-operative HR values of the patients between both the groups (p>0.05).

FIGURE 15: TRENDS OF INTRA-OPERATIVE SYSTOLIC BLOOD PRESSURE (SBP) VALUES IN BOTH GROUPS



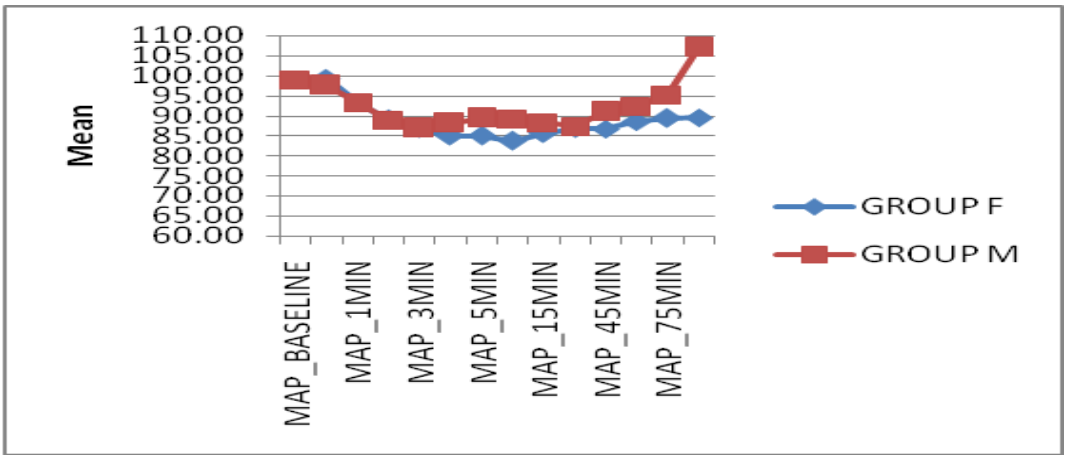
There was no statistically significant difference in SBP at all time points intraoperatively in both the groups (p>0.05).

FIGURE 16: TRENDS OF INTRA-OPERATIVE DIASTOLIC BLOOD PRESSURE (DBP) VALUES IN BOTH GROUPS



There was no statistically significant difference between the intra-operative diastolic blood pressure (DBP) values of the patients between both the groups (p>0.05).

FIGURE 17: TRENDS OF INTRA-OPERATIVE MEAN ARTERIAL PRESSURE (MAP) VALUES IN BOTH GROUPS



There was no statistically significant difference between the intra-operative mean arterial pressure (MAP) values of the patients between both the groups (p>0.05).

TABLE 12: COMPARISON OF OCCURANCE OF EPISODES OF INTRAOPERATIVE BRADYCARDIA AND HYPOTENSION

		GROUP F		GROUP M		Total	Chi-square value	p-value
		No. of cases	%age	No. of cases	%age			
HYPOTENSION	NO	23	76.7%	25	83.3%	48	1.355	0.508
	YES	7	23.3%	5	16.7%	12		
Total		30	100.0%	30	100.0%	60		
BRADYCARDIA	NO	30	100.0%	29	96.7%	59	2.069	0.355
	YES	0	0.0%	1	3.3%	1		
Total		30	100.0%	30	100.0%	60		

Intraopreative hypotension was seen in 23.3% of patients in group F and 15.7% of patients in group M. The difference between both groups in terms of hypotension and bradycardia was statistically insignificant.(p-value>0.05)

FIGURE 18: COMPARISON OF OCCURANCE OF EPISODES OF INTRAOPERATIVE BRADYCARDIA AND HYPOTENSION

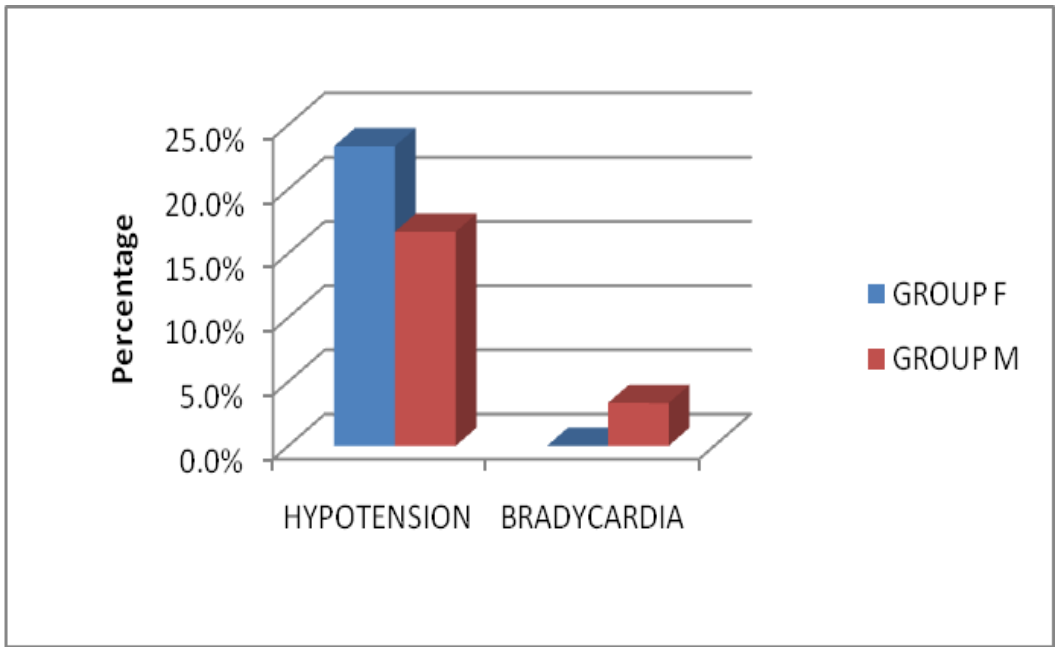
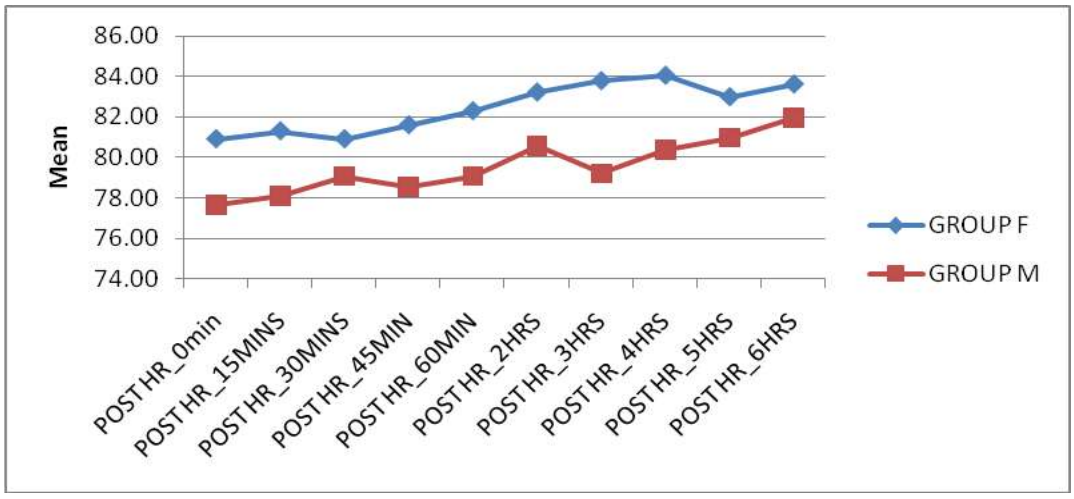
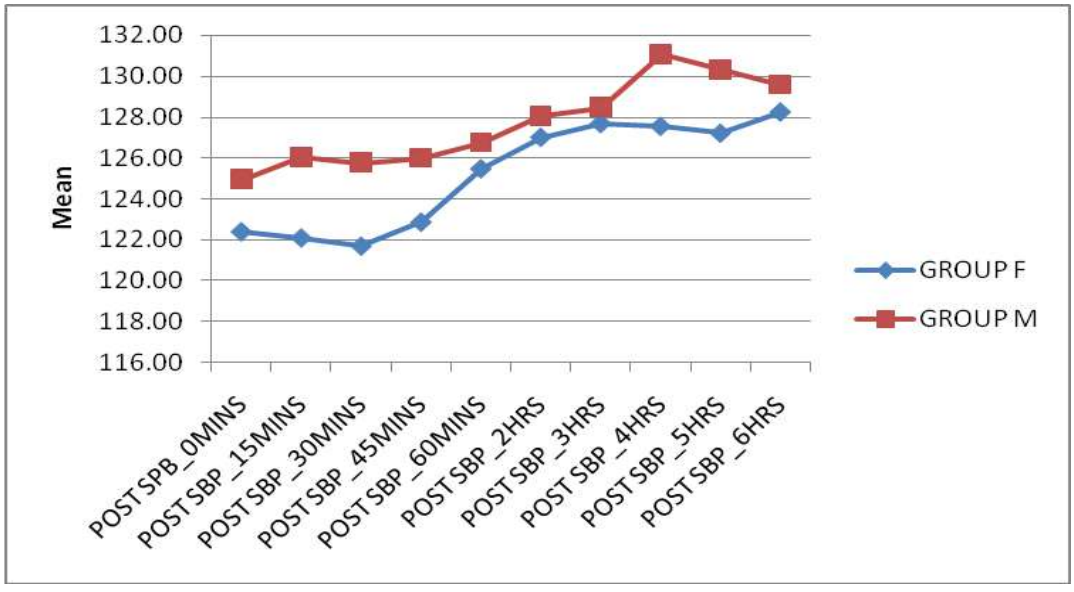


FIGURE 19: TRENDS OF POST-OPERATIVE HR VALUES IN BOTH GROUPS



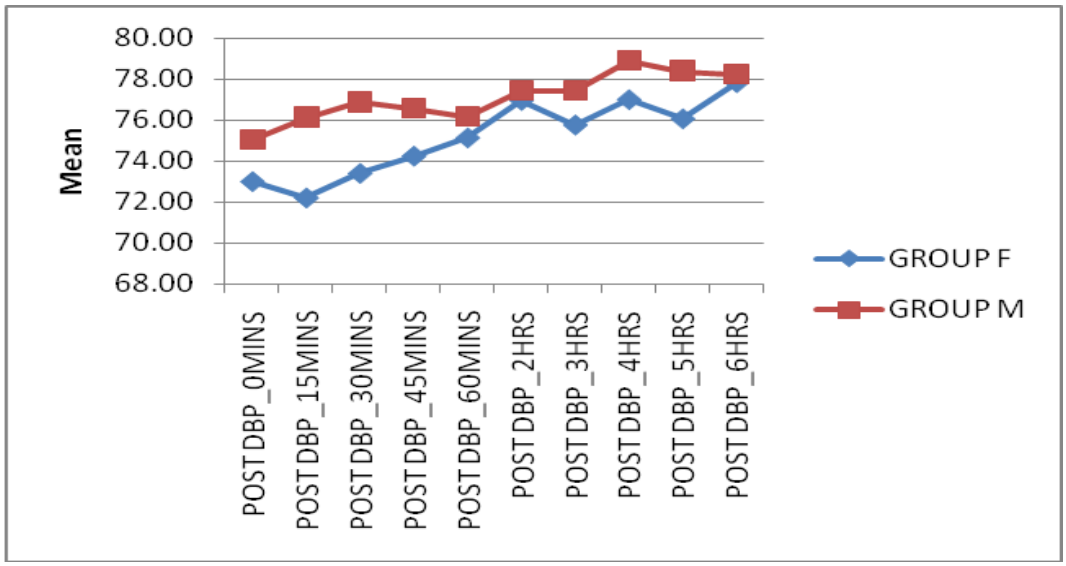
The HR was comparable in both the groups at all time points (p>0.05).

FIGURE 20: TRENDS OF POST-OPERATIVE SYSTOLIC BLOOD PRESSURE (SBP) VALUES IN BOTH THE GROUPS



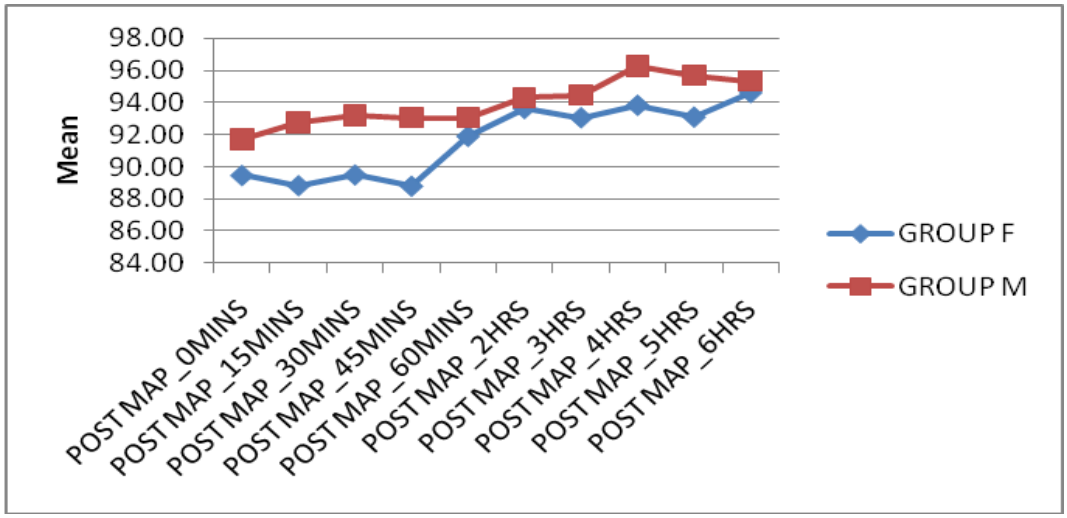
All the time points were statistically insignificant and comparable for Systolic blood pressure (SBP) between the two groups with p-value >0.05.

FIGURE 21: TRENDS OF POST-OPERATIVE DIASTOLIC BLOOD PRESSURE (DBP) VALUES IN BOTH THE GROUPS



All the time points were statistically insignificant and comparable for Diastolic blood pressure (DBP) between the two groups with p-value >0.05

FIGURE 22: COMPARISON OF STUDY GROUPS ACCORDING TO POST-OPERATIVE MEAN ARTERIAL PRESSURE (MAP) VALUES



There was no statistically significant difference for the post-operative MAP values amongst the patients between the two groups (p>0.05).

DISCUSSION

Subarachnoid block is preferred mode of anaesthesia for lower abdominal surgeries. Bupivacaine have been traditionally used as local anaesthetic agent for intrathecal block. Ropivacaine is newer longer acting amine local anaesthetic with better hemodynamic profile and lesser systemic side effects. Various drugs are used as intrathecal adjuvants with local anaesthetics to prolong duration of analgesia, sensory and motor block, and reduce the side effects by reducing their dose required. These adjuvants can be broadly divided into opioid or non opioid group. Fentanyl is most commonly used opioid as intrathecal additive. Though improving analgesia and duration of block, it shows many side effects like pruritus, nausea, dizziness, sedation, and respiratory depression. Magnesium sulphate, a centrally acting NMDA receptor antagonist, can be added intrathecally to LA. Devoid of side effects like pruritus, dizziness, sedation, it can also potentiate intrathecal block when given with LA.

In this study we compared efficacy of fentanyl from opioid group and magnesium sulphate from non opioid group as adjuvants with 0.75% hyperbaric ropivacaine for sub arachnoid block in terms of onset and duration of motor and sensory block and hemodynamic parameters. Our RCT enrolled sixty ASA I-II patients posted for lower abdominal surgeries under spinal anaesthesia who were analyzed statistically. Adequate anaesthesia was achieved in all the patients to undergo operative procedures.

Dose of intrathecal magnesium was decided on the observations made by Katiyar S et al. They studied two different doses of intrathecal $MgSO_4$ (50mg and 100mg) and observed that 100mg of intrathecal $MgSO_4$ increased duration of analgesia without producing any hemodynamic side effects. Thus dose of 100mg $MgSO_4$ was selected to be used as adjuvant.[33]

Onset of sensory block was defined as time from intrathecal injection to sensory blockade at T8 dermatome. In our study we observed a statistically significant increase in mean time of onset for sensory block for group M (6.60±3.38 mins) as compared to group F (4.1±1.84 mins) with p-value 0.002.

The delay in onset was also observed by Kumar N et al in 2023, when they added 75 mg $MgSO_4$ to ropivacaine for subarachnoid block.[38] They did a RCT to compare 10mcg of dexmedetomidine and 75 mg $MgSO_4$ as adjuvants with 18 mg of ropivacaine. They observed that mean onset time of sensory block in minutes to T10 level with dexmedetomidine was 4.440 ± 0.50 mins and with $MgSO_4$ was 6.680 ± 0.69 mins with (p-value<0.001). This could be attributed to change in pH and baricity of the intrathecal fluid by addition of magnesium. Our findings were also in congruence with observations made by Srikanth S et al.[37] They compared block characteristics produced by 15 mg of hyperbaric ropivacaine alone and with 75 mg $MgSO_4$. They found that the mean time of onset of sensory block was prolonged when $MgSO_4$ was used as adjuvant with ropivacaine. The onset of sensory block was found to be 5.52 ± 0.87 min with 15mg ropivacaine when 75 mg $MgSO_4$ was added, whereas with ropivacaine alone it was 3.35 ± 0.8 mins with p=0.01. Kathuria B et al also found similar results in their studies. Other factor leading to the delayed onset of block could be activation of ctyochrome p450 by magnesium, which in turn increase metabolism of ropivacaine. $MgSO_4$ also causes local vasodilation, which increases vascular uptake of local anaesthetic agent and thus causing delay in onset of sensory block.[39]

Duration of sensory block was defined as time from onset of block to two segment regression in sensory block. In our study the mean duration of sensory block was 64.17± 14.51 mins for group F and 71.83±17.49 mins for group M. The mean duration of sensory block between two groups was

statistically insignificant (p-value>0.115). Our results were in congruence with study done by Ashraf A et al. They observed a significantly prolonged duration of sensory block with magnesium as compared to fentanyl. They compared 12.5 mcg of fentanyl and 100 mg $MgSO_4$ as adjuvants with 12.5 mg ropivacaine and found that mean duration of sensory block was 247.2±8.17 min with $MgSO_4$ and 205.7±3.06 mins with fentanyl. The difference in mean time for onset of sensory block between two groups was statistically significant (p-value<0.001). This could be attributable to the lower dose of fentanyl 12.5 mcg used by them instead of 25 mcg used in our study.[40]

In contrast to our study Modir et al observed that duration of sensory block was longer with fentanyl, when they compared fentanyl, $MgSO_4$ and dexmedetomidine as adjuvants with 15 mg of ropivacaine for spinal anaesthesia. They used 50 mcgs of Fentanyl and 200mg of $MgSO_4$ and 10 mcg of dexmedetomidine as adjuvants with 15 mg of ropivacaine in three different patient groups. They observed that the mean duration of sensory block with fentanyl was 161.5 ± 10.00 mins and with $MgSO_4$ was 159.16 ± 9.56 mins. Although the mean time of onset was less in dexmedetomidine group, it was comparable in fentanyl and $MgSO_4$ group.[41]

Time taken to attain highest level of sensory block was 9.97±3.37 mins in group F, while it was 13.8±6.1 mins in group M. The difference was statistically significant (p-value=0.007). These findings were in concordance with studies done by Unlugenc H et al and Arora B et al. Unlugenc H et al compared 50mg $MgSO_4$ and 25 mcg fentanyl when used with 10 mg bupivacaine. They observed that median time to reach maximum dermatome height of sensory block was significantly faster in fentanyl group (5.9 min) than in $MgSO_4$ group (7.3 min). Arora B et al, in their study, added either 12.5 mcg fentanyl or 50 mg $MgSO_4$ with 10 mg

bupivacaine. The mean time to reach maximum block height with in fentanyl group was 5.3 ± 0.5 min and in $MgSO_4$ group was 8.7 ± 0.5 min with p-value of 0.001. [42,43]

Maximum level of sensory block achieved was T4 in both groups. The maximum block height of T4 was obtained in 83.3% of patients in group F and 66.7% of patients in group M. The difference was statistically insignificant with p-value > 0.05.

Onset of motor blockade was defined as time required to achieve MBS 3. Mean time taken by group M was 7.87±6.58 mins and by group F was 4.20±2.14 mins. The difference was statistically significant (p-value=0.001).The study done by Sunil B.V et al produced similar results when they compared fentanyl 25 mcg and $MgSO_4$ 50 mg with 15 mg bupivacine. They observed the mean time for onset of motor block was 4.91±1.30 mins with fentanyl and 7.28±1.21 mins with $MgSO_4$.[44] Same observation was made by Makhni R et al and Kumar N et al in their studies.[38,45]

The duration of motor block was defined as time till motor regression to MBS 0.The difference in mean duration of motor block in Group M(120.83 ± 30.17 mins) and group F (124.67±25.19 mins) was statistically insignificant(p-value).

The duration of analgesia was defined as time from intrathecal injection to patients demand for rescue analgesic. The mean duration of analgesia was 276.27 ± 69.66 mins in group F while it was 263.73 ± 59.86 mins in group M. The difference between both groups was statistically insignificant (p-value=0.778). Katiyar S et al observed the relative prolongation of duration of analgesia when 100mg $MgSO_4$ (328.13 min) was used instead of 50mg $MgSO_4$ (274.87 min), which was comparable when fentanyl 25 mcg(374.37 min) was used. Khezri MB et al, in their study, found that

when 50mg $MgSO_4$ was compared with 25 mcg of fentanyl, the analgesia time was more with fentanyl group 183.833±13.25 mins as compared to 133.70±13.60 mins with $MgSO_4$.[46] We deduced that the analgesia time provided by $MgSO_4$ could be dose dependent, based on previous literature.

We recorded the SBP, DBP, MAP, HR and SpO_2 and various time intervals both intra operatively and post operatively. Hemodynamic parameters were comparable at all time intervals for both groups with no statistically significant difference. Incidence of hypotension was seen in 23.3% cases in group F and 16.7% cases in group M intraoperatively. The difference was statistically insignificant implying $MgSO_4$ in dose of 100mg had similar hemodynamic profile as compared to fentanyl 25 mcg when used intrathecally. Similar hemodynamic profile of both drugs was also seen in previous studies by Khazeri MB et al, Katiyar S et al and Unlugenc H et al.[33,43,46]

SUMMARY AND CONCLUSION

This study was conducted in Department of Anaesthesiology, Dayanand Medical College and Hospital, Ludhiana after approval from institutional ethics committee. It was done to compare efficacy of $MgSO_4$ and Fentanyl as adjuvants to intrathecal 0.75% hyperbaric Ropivacaine for lower abdominal surgeries under subarachnoid block. The study was performed on sixty ASA I-II patients of age group 18 years and above and either gender. A detailed pre anaesthetic check up was done and written informed consent was taken before shifting the patients to OT.

The patients were divided into two groups of 30 each:

Group F: Patients in this group received 2.5 ml of 0.75% hyperbaric ropivacaine (18.75mg) + 0.5 ml of fentanyl (25 mcg) to make total volume of 3.0 ml.

Group M: Patients in this group received 2.5 ml of 0.75% hyperbaric ropivacaine (18.75 mg) + 0.2ml of magnesium sulphate (100 mg) + 0.3 ml of distilled water to make total volume of 3 ml.

There was no statistically significant difference in demographic profile (age, sex, BMI, ASA physical status) of patients in both group. The onset of sensory and motor block was faster in group receiving fentanyl as adjuvant as compared to group receiving magnesium sulphate. In terms of duration of sensory and motor block, highest level of sensory block attained and time required to attain highest block height, time of analgesia and intraoperative and post operative hemodynamic parameters, the difference in both groups was statistically insignificant.

We concluded that fentanyl is a better adjuvant to intrathecal ropivacaine than $MgSO_4$ due to faster onset of sensory and motor block.

BIBLIOGRAPHY

1. Gerheuser F, Crass D. [Spinal anaesthesia]. Anaesthesist. 2005;54(12):1245–70.
2. Chattopadhyay A, Maitra S, Sen S, Bhattacharjee S, Layek A, Pal S, et al. A study to compare the analgesic efficacy of intrathecal bupivacaine alone with intrathecal bupivacaine midazolam combination in patients undergoing elective infraumbilical surgery. Anesthesiol Res Pract. 2013;2013:567134.
3. Kuthiala G, Chaudhary G. Ropivacaine: A review of its pharmacology and clinical use. Indian J Anaesth. 2011;55(2):104–10.
4. McDonald SB, Liu SS, Kopacz DJ, Stephenson CA. Hyperbaric Spinal Ropivacaine. Anesthesiology. 1999;90(4):971–7.
5. Simpson D, Curran MP, Oldfield V, Keating GM. Ropivacaine: a review of its use in regional anaesthesia and acute pain management. Drugs. 2005;65(18):2675–717.
6. Gautier PE, De Kock M, Van Steenberge A, Poth N, Lahaye-Goffart B, Fanard L, et al. Intrathecal ropivacaine for ambulatory surgery. Anesthesiology. 1999;91(5):1239–45.
7. Heller AR, Zimmermann K, Seele K, Rössel T, Koch T, Litz RJ. Modifying the Baricity of Local Anesthetics for Spinal Anesthesia by Temperature Adjustment. Anesthesiology. 2006;105(2):346–53.
8. Kallio H, Snäll EVT, Tuomas CA, Rosenberg PH. Comparison of hyperbaric and plain ropivacaine 15 mg in spinal anaesthesia for lower limb surgery. Br J Anaesth. 2004;93(5):664–9.
9. Fettes PDW, Hocking G, Peterson MK, Luck JF, Wildsmith J a. W. Comparison of plain and hyperbaric solutions of ropivacaine for spinal anaesthesia. Br J Anaesth. 2005;94(1):107–11.
10. Mehta N, Aasima Tu Nisa Qazi S. Adjuvant Drugs to Local Anesthetics [Internet]. In: M. Whizar-Lugo V, Hernández-Cortez E, editors. Topics in Local Anesthetics. IntechOpen; 2020 [cited 2024 Jul

5]. Available from: https://www.intechopen.com/books/topics-in-local-anesthetics/adjuvant-drugs-to-local-anesthetics

11. Swain A, Nag DS, Sahu S, Samaddar DP. Adjuvants to local anesthetics: Current understanding and future trends. World J Clin Cases. 2017;5(8):307–23.
12. Gupta K, Singh S, Sharma D, Gupta PK, Krishan A, Pandey MN. Intrathecal fentanyl as an adjuvant to 0.75% isobaric ropivacaine for infraumbilical surgery under subarachnoid block: A prospective study. Saudi J Anaesth. 2014;8(1):64–8.
13. Grass JA. Fentanyl: Clinical use as postoperative analgesic—Epidural/intrathecal rout. Journal of Pain and Symptom Management. 1992;7(7):419–30.
14. Cummings A, Orgill BD, Fitzgerald BM. Intrathecal Morphine [Internet]. In: StatPearls. Treasure Island (FL): StatPearls Publishing; 2024 [cited 2024 Jul 23]. Available from: http://www.ncbi.nlm.nih.gov/books/NBK499880/
15. Ali MA, Ismail S, Sohaib M, Aman A. A double-blind randomized control trial to compare the effect of varying doses of intrathecal fentanyl on clinical efficacy and side effects in parturients undergoing cesarean section. J Anaesthesiol Clin Pharmacol. 2018;34(2):221–6.
16. Ben-David B, Solomon E, Levin H, Admoni H, Goldik Z. Intrathecal fentanyl with small-dose dilute bupivacaine: better anesthesia without prolonging recovery. Anesth Analg. 1997;85(3):560–5.
17. Chung CJ, Yun SH, Hwang GB, Park JS, Chin YJ. Intrathecal fentanyl added to hyperbaric ropivacaine for cesarean delivery. Reg Anesth Pain Med. 2002;27(6):600–3.
18. Carvalho B. Respiratory depression after neuraxial opioids in the obstetric setting. Anesth Analg. 2008;107(3):956–61.
19. Ascher P, Nowak L. Electrophysiological studies of NMDA receptors. Trends in Neurosciences. 1987;10(7):284–8.

20. Do SH. Magnesium: a versatile drug for anesthesiologists. Korean J Anesthesiol. 2013;65(1):4–8.
21. Patel S. Epidural and intrathecal magnesium sulphate administration errors: clinical features and contributing factors. British Journal of Anaesthesia. 2023;130(4):e435–40.
22. PubChem. Ropivacaine [Internet]. [cited 2024 Jul 23];Available from: https://pubchem.ncbi.nlm.nih.gov/compound/175805
23. Selander D, Sjövall J, Waldenlind L. Accidental I.V. Injections of Ropivacaine: Clinical Experiences of Six Cases. Reg Anesth Pain Med. 1997;22(Suppl 2):70.
24. Akerman B, Hellberg IB, Trossvik C. Primary evaluation of the local anaesthetic properties of the amino amide agent ropivacaine (LEA 103). Acta Anaesthesiol Scand. 1988;32(7):571–8.
25. Whiteside JB, Burke D, Wildsmith J a. W. Comparison of ropivacaine 0.5% (in glucose 5%) with bupivacaine 0.5% (in glucose 8%) for spinal anaesthesia for elective surgery. Br J Anaesth. 2003;90(3):304–8.
26. McNamee DA, McClelland AM, Scott S, Milligan KR, Westman L, Gustafsson U. Spinal anaesthesia: comparison of plain ropivacaine 5 mg ml(-1) with bupivacaine 5 mg ml(-1) for major orthopaedic surgery. Br J Anaesth. 2002;89(5):702–6.
27. Erturk E, Tutuncu C, Eroglu A, Gokben M. Clinical comparison of 12 mg ropivacaine and 8 mg bupivacaine, both with 20 microg fentanyl, in spinal anaesthesia for major orthopaedic surgery in geriatric patients. Med Princ Pract. 2010;19(2):142–7.
28. Khalil RS, Mehmud A, Banerjee R, Malhotra R, Banerjee A. Intrathecal ropivacaine versus bupivacaine in a non-obstetric population- A meta-analysis and trial sequential analysis. Indian Journal of Anaesthesia. 2024;68(2):129–41.

29. Chung CJ, Yun SH, Hwang GB, Park JS, Chin YJ. Intrathecal fentanyl added to hyperbaric ropivacaine for cesarean delivery. Reg Anesth Pain Med. 2002;27(6):600–3.
30. Bathari R, Bhalotra A, Anand R, Kumar V. A randomised trial to compare the effect of addition of clonidine and fentanyl to hyperbaric ropivacaine for spinal anaesthesia for knee arthroscopy. S Afr J Anaesth Analg. 2016;22:14–8.
31. Weigl W, Bieryło A, Wielgus M, Krzemień-Wiczyńska Ś, Kołacz M, Dąbrowski MJ. Perioperative analgesia after intrathecal fentanyl and morphine or morphine alone for cesarean section: A randomized controlled study. Medicine (Baltimore). 2017;96(48):e8892.
32. Pascual-Ramírez J, Gil-Trujillo S, Alcantarilla C. Intrathecal magnesium as analgesic adjuvant for spinal anesthesia: a meta-analysis of randomized trials. Minerva Anestesiol. 2013;79(6):667–78.
33. Katiyar S, Dwivedi C, Tipu S, Jain RK. Comparison of different doses of magnesium sulphate and fentanyl as adjuvants to bupivacaine for infraumbilical surgeries under subarachnoid block. Indian J Anaesth. 2015;59(8):471–5.
34. Paleti S, Prasad PK, Lakshmi BS. A randomized clinical trial of intrathecal magnesium sulfate versus midazolam with epidural administration of 0.75% ropivacaine for patients with preeclampsia scheduled for elective cesarean section. J Anaesthesiol Clin. Pharmacol 2018;34(1):23–8.
35. Deepa T, Chandran D. Effect of addition of intrathecal magnesium sulphate to 0.5% hyperbaric bupivacaine and 0.5% isobaric levobupivacaine on duration of analgesia in parturients undergoing elective caesarean section: A prospective randomised study. J Anaesthesiol Clin Pharmacol. 2021;37(4):633–8.
36. Saxena S, Kumar K, Gupta R, Agrawal A. An evaluation of hyperbaric ropivacaine with magnesium as an adjuvant in lower abdominal

surgeries among the north Indian subjects: a double-blind randomized trial. Int J Res Med Sci. 2019;7(9):3468.

37. Srikanth S, S A, Kamaeshar Y, Mishra G. Comparison of intrathecal hyperbaric ropivacaine 0.5% with and without 75 mg magnesium sulfate as an adjuvant for infra umbilical surgeries: a double-blind randomized clinical trial. Asian Journal of Pharmaceutical and Clinical Research. 2021;117–21.
38. Kumar N, Vimal R, Madhusudhanan R. A comparative study of dexmedetomidine and magnesium sulfate as adjuvants with ropivacaine for spinal anaesthesia in infraumbilical surgeries and postoperative analgesia [Internet]. 2023 [cited 2024 Jul 16]. Available from: https://www.semanticscholar.org/paper/a-comparative-study-of-dexmedetomidine-and-sulfate-kumar-vimal/d6940b2c3d96f6aa2dd36f1b041b1c5a34830d24
39. Kathuria B, Luthra N, Gupta A, Grewal A, Sood D. Comparative Efficacy of Two Different Dosages of Intrathecal Magnesium Sulphate Supplementation in Subarachnoid Block. J Clin Diagn Res. 2014;8(6):GC01–5.
40. Sayed Ahmed A, Abaza K, El Sadek D. Fentanyl versus magnesium sulphate as adjuvant to hyperbaric bupivacaine in spinal anesthesia for elective cesarean sections. Zagazig University Medical Journal. 2018;24(2):123–8.
41. Modir H, Hafez-Alsehe N, Almasi-Hashiani A, Kamali A. Effects of dexmedetomidine, fentanyl and magnesium sulfate added to ropivacaine on sensory and motor blocks in lower abdominal surgery: a randomized clinical trial. Medical Gas Research. 2024;14(3):102.
42. Arora B, Pathak DG, Tarat A, Sutradhar D, Nath R, Sheokand B. Comparison of intrathecal magnesium and fentanyl as adjuvants to hyperbaric bupivacaine in preeclamptic parturients undergoing

elective cesarean sections. Journal of Obstetric Anaesthesia and Critical Care. 2015;5(1):9.

43. Unlugenc H, Ozalevli M, Gunduz M, Gunasti S, Urunsak IF, Guler T, et al. Comparison of intrathecal magnesium, fentanyl, or placebo combined with bupivacaine 0.5% for parturients undergoing elective cesarean delivery. Acta Anaesthesiol Scand. 2009;53(3):346–53.
44. Sunil B, Sahana K. Comparison of Dexmedetomidine, Fentanyl and Magnesium Sulfate as Adjuvants with Hyperbaric Bupivacaine for Spinal Anesthesia: A Double Blind Controlled Study [Internet]. 2013 [cited 2024 Jul 22]. Available from: https://www.semanticscholar.org/paper/Comparison-of-Dexmedetomidine%2C-Fentanyl-and-Sulfate-Sunil-Sahana/6ea2c357a821f44045a3dd662dd5397a9240aee9#citing-papers
45. Makhni R, Attri J, Jain P, Chatrath V. Comparison of dexmedetomidine and magnesium sulfate as adjuvants with ropivacaine for spinal anesthesia in infraumbilical surgeries and postoperative analgesia. Anesth Essays Res. 2017;11(1):206.
46. Khezri MB, Yaghobi S, Hajikhani M, Asefzadeh S. Comparison of postoperative analgesic effect of intrathecal magnesium and fentanyl added to bupivacaine in patients undergoing lower limb orthopedic surgery. Acta Anaesthesiologica Taiwanica. 2012;50(1):19–24.

Sr. No.	MRD NUMBER	INITIALS	AGE	SEX	TREATMENT GROUP	BMI	CO-MORBIDITIES	ASA GRADE	HR BASELINE	HR 0MIN	HR 1MIN	HR 2MIN	HR 3MIN	HR 4MIN	HR 5MIN	HR 10MIN	HR 15MIN	HR 30MIN	HR 45MIN	HR 60MIN	HR 75MIN
1	555096	AC	29	M	F	18.9	NONE	1	88	85	90	89	84	81	86	91	79	74	78	81	84
2	1203914	GS	60	M	F	26.9	ALCHOHOLIC	2	61	61	61	63	66	65	61	60	63	60	60	60	-
3	7092	PK	62	F	M	27.3	NONE	1	89	89	99	101	92	91	88	83	84	76	75	73	77
4	1499773	HP	46	M	M	26.9	HYPERTENSION	2	70	67	69	68	63	64	64	65	61	61	60	60	-
5	1525770	NK	53	M	M	26.8	NONE	1	62	60	64	62	66	60	58	60	57	59	62	58	-
6	1422679	PS	65	M	F	20	NONE	1	95	88	91	97	100	105	102	99	92	92	92	93	93
7	1622829	TS	24	M	F	19.7	NONE	1	75	77	79	76	78	74	72	74	76	78	77	74	-
8	1520279	SK	38	F	M	26.2	NONE	1	85	87	79	74	82	84	74	64	60	62	-	-	-
9	1371506	NK	31	F	F	30.8	OBESITY	2	80	82	89	84	82	81	72	78	76	81	82	81	84
10	1525922	SK	62	M	M	19.7	HYPERTENSION	2	72	78	84	75	71	68	67	65	69	70	72	-	-
11	1582357	SS	41	M	F	28.2	SMOKER	2	63	70	74	71	69	63	60	59	61	62	64	62	63
12	1722847	SK	18	M	M	21.8	NONE	1	78	79	84	78	74	75	71	70	68	69	67	-	-
13	1728977	KL	62	M	M	28.3	HYPERTENSION	2	80	86	84	82	78	76	74	78	81	70	70	-	-
14	1711255	SS	34	M	M	26.9	NONE	1	82	80	78	80	80	79	75	79	85	74	72	79	-
15	1573795	HK	77	M	F	15	NONE	1	64	80	82	88	86	86	84	85	76	81	77	80	80
16	1723934	DS	46	M	M	25	HYPERTENSION	2	100	102	100	97	98	97	107	107	104	98	102	104	-
17	1723903	TN	50	M	F	27	HTN	2	90	100	108	120	110	108	106	104	90	86	88	92	-
18	1533134	NC	34	M	M	30.6	OBESE	2	125	112	95	90	95	87	88	87	84	86	82	84	86
19	1533078	NG	45	F	F	27.1	NONE	1	85	86	93	96	92	92	92	92	86	82	88	75	78
20	1533704	HS	55	M	F	30	OBESE, ALCOHOIC,HTN	2	98	100	102	103	107	102	95	95	87	90	87	83	-
21	1533799	RS	58	M	M	27.5	NONE	1	100	100	101	104	100	96	92	88	84	80	82	-	-
22	1506922	CG	35	F	M	20.8	NONE	1	69	70	72	76	73	73	71	63	69	60	64	-	-
23	1532795	T	21	M	F	24.2	ALCHOHOLIC	2	80	82	78	70	66	63	67	63	63	58	64	62	64
24	1534802	KS	24	M	M	24	NONE	1	60	64	65	68	68	70	66	67	55	53	52	51	53
25	1535909	JS	45	M	M	26.8	HTN , DM2	2	96	98	92	98	96	94	96	92	86	74	80	82	84
26	1536441	PK	65	M	F	30.2	HTN, OBESE	2	100	100	99	104	97	86	82	84	86	85	76	-	-
27	1538173	HK	29	M	M	22.8	ASTHMA	2	92	116	110	94	68	78	82	90	94	88	78	77	87
28	77616	JS	49	M	M	24	NONE	1	82	74	69	68	70	72	66	64	68	71	70	72	-
29	1539417	JK	21	F	F	19	ANEMIA	2	102	100	98	110	108	102	96	100	100	98	98	100	103
30	1169282	BK	51	F	F	27.3	DM2	2	85	86	93	96	92	92	91	92	86	82	83	75	78
31	1539532	PK	57	M	M	27.5	NONE	1	100	100	101	104	100	96	92	88	84	80	82	83	76
32	1482822	RK	55	M	M	31.1	OBESE	2	98	100	102	103	107	102	95	95	87	90	87	83	-
33	1532143	HS	47	M	F	25.3	NONE	1	82	74	69	68	70	72	66	64	78	71	70	-	-
34	1449282	TC	56	M	F	28.5	HTN	2	90	94	94	89	84	83	83	81	74	70	68	67	68
35	1538306	VS	23	M	M	22.1	NONE	1	86	86	79	80	80	81	73	66	76	77	82	82	-
36	1475162	RK	43	M	F	26.4	SMOKER, HTN	2	100	102	100	97	98	97	107	107	104	98	102	104	107
37	1536290	MS	31	M	M	30.2	OBESE	2	90	100	108	120	110	108	106	104	90	96	88	-	-
38	1548518	UK	41	M	F	26.8	ALCHOHOLIC	2	98	87	98	82	87	88	82	80	72	71	68	-	-
39	1470289	L	30	F	M	24.6	NONE	1	110	99	100	98	92	94	99	90	83	84	84	86	-
40	1515291	LS	47	M	F	29.3	NONE	1	99	96	96	100	101	104	106	99	103	101	102	103	108
41	380714	PB	33	M	M	29.3	ALCHOHOLIC	2	76	72	70	72	73	74	70	68	70	72	68	70	-
42	1569844	TG	19	M	F	22.5	NONE	1	102	100	98	110	108	102	96	100	100	98	98	-	-
43	1569828	S	18	M	M	23.5	NONE	1	74	70	68	64	64	70	72	70	72	73	72	-	-
44	1570423	RK	38	F	F	21	NONE	1	76	82	90	96	104	82	79	68	65	71	70	-	-
45	1565444	MK	42	F	F	24.2	NONE	1	95	94	94	90	93	86	89	71	88	79	73	74	-
46	1572073	P	46	F	M	29	HTN	2	108	99	97	96	90	90	88	82	81	79	74	72	74
47	1569718	SJ	27	M	M	17.7	NONE	1	70	72	75	69	65	64	70	72	74	75	72	-	-
48	1522895	AK	28	M	F	30.2	ALCOHOLIC	2	65	59	62	63	61	68	66	69	58	65	69	72	73
49	1576762	AS	42	M	F	24.1	HTN	2	82	84	84	79	74	71	73	76	72	81	82	-	-
50	1464462	P	21	M	F	22.4	NONE	1	90	92	89	86	82	81	76	74	76	78	81	83	84

Sr. No.	MRD NUMBER	HR 90MIN	SBP BASELINE	SBP 0MIN	SBP 1MIN	SBP 2MIN	SBP 3MIN	SBP 4MIN	SBP 5MIN	SBP 10MIN	SBP 15MIN	SBP 30MIN	SBP 45MIN	SBP 60MIN	SBP 75MIN	SBP 90MIN	DBP BASELINE	DBP 0MIN	DBP 1MIN	DBP 2MIN	DBP 3MIN	DBP 4MIN	DBP 5MIN	DBP 10MIN	DBP 15MIN
1	555096	85	136	134	136	135	140	120	125	128	120	121	119	128	-	-	86	84	76	79	78	74	77	76	80
2	1203914	-	149	143	142	134	126	116	104	112	101	112	114	128	-	-	82	88	87	72	64	64	59	65	52
3	7092	70	140	150	160	147	129	133	132	133	138	120	125	129	144	143	90	101	93	87	80	84	80	79	78
4	1499773	-	140	137	132	127	130	133	132	128	130	127	115	135	-	-	82	76	74	74	77	74	75	72	62
5	1525770	-	104	102	102	104	106	109	113	111	104	109	114	112	-	-	67	65	64	67	68	69	67	66	69
6	1422679	87	134	162	139	128	119	116	111	100	118	116	119	110	105	118	76	102	97	70	72	72	68	62	70
7	1622829	-	128	135	126	118	112	110	102	96	90	126	122	124	-	-	70	75	75	70	64	50	48	42	40
8	1520279	-	138	150	126	122	129	129	129	155	140	146	-	-	-	-	83	71	76	71	69	73	73	72	60
9	1371506	-	138	146	144	130	128	126	129	134	135	131	129	134	140	-	78	90	88	69	74	68	69	71	75
10	1525922	-	140	140	130	138	136	138	134	138	138	142	138	-	-	-	84	76	74	68	68	66	76	78	86
11	1582357	-	114	96	88	102	116	120	114	120	120	128	120	121	121	-	60	50	48	60	66	70	66	62	72
12	1722847	-	128	134	126	121	118	119	119	122	119	119	118	-	-	-	74	80	70	67	63	64	71	67	69
13	1728977	-	127	130	124	120	118	120	115	115	120	110	111	-	-	-	86	89	84	82	79	80	80	80	72
14	1711255	-	146	148	142	147	146	147	129	133	133	126	126	127	-	-	80	86	81	85	80	79	82	85	77
15	1573795	-	140	142	137	130	128	123	120	123	125	114	110	120	128	-	79	82	95	90	89	84	81	78	85
16	1723934	-	128	130	102	80	70	101	105	95	102	102	104	108	-	-	80	80	68	40	30	61	62	54	67
17	1723903	-	130	136	120	114	110	104	104	90	110	116	124	124	-	-	90	94	80	72	70	68	70	40	70
18	1533134	-	145	140	154	159	159	153	160	159	151	141	150	146	147	-	103	100	102	104	100	90	101	96	91
19	1533078	89	131	137	125	118	123	124	127	124	129	113	111	109	100	106	88	65	70	65	68	69	79	78	77
20	1533704	-	136	138	130	100	110	110	120	117	100	102	108	115	-	-	90	89	79	75	65	65	75	68	68
21	1533799	-	120	118	114	104	87	98	90	97	90	82	99	-	-	-	83	70	66	56	51	54	53	62	59
22	1506922	-	130	146	123	130	124	132	130	122	128	130	124	-	-	-	78	60	55	55	65	65	56	58	65
23	1532795	65	120	120	110	102	102	109	104	100	98	100	100	99	98	99	70	70	64	64	64	68	62	58	56
24	1534802	-	133	140	154	150	146	140	139	122	127	129	136	134	133	-	70	70	74	68	68	62	76	65	68
25	1535909	-	136	130	134	138	129	130	138	149	136	138	140	142	144	-	86	80	84	82	79	80	80	82	74
26	1536441	-	138	140	134	134	138	112	114	118	116	124	122	-	-	-	82	86	80	82	82	66	73	66	70
27	1538173	-	128	112	110	96	96	98	118	120	115	115	118	121	121	-	76	70	70	47	50	50	65	67	68
28	77616	-	136	118	99	98	104	108	109	107	108	110	105	108	-	-	81	74	66	62	68	71	74	72	72
29	1539417	102	134	130	127	127	117	120	122	126	119	120	120	118	118	117	90	90	84	82	76	72	70	77	77
30	1169282	-	131	137	125	118	123	124	117	124	129	113	118	109	100	-	88	65	70	65	68	69	79	77	77
31	1539532	-	120	118	114	104	87	98	90	97	90	82	99	96	96	-	83	70	66	56	51	54	53	62	59
32	1482822	-	136	138	130	100	110	110	118	115	98	102	108	115	-	-	90	89	79	75	65	65	75	68	68
33	1532143	-	136	118	99	98	104	108	111	109	110	110	105	-	-	-	81	74	66	62	68	71	74	72	72
34	1449282	68	150	153	136	138	135	134	130	121	132	130	132	139	136	137	100	98	93	94	89	87	82	68	88
35	1538306	-	126	126	130	137	137	134	126	122	125	121	126	124	-	-	72	74	61	74	72	63	65	77	60
36	1475162	-	128	130	102	80	70	101	107	97	104	102	104	108	110	-	80	80	68	40	30	61	62	54	67
37	1536290	-	130	136	120	114	110	104	102	88	108	116	124	-	-	-	90	94	80	72	70	68	70	40	70
38	1548518	-	150	153	136	138	135	132	130	123	132	132	131	-	-	-	100	98	93	94	89	89	80	67	89
39	1470289	-	124	126	122	120	118	120	124	109	105	120	124	124	-	-	82	84	82	80	78	78	73	70	80
40	1515291	-	126	126	128	130	130	132	138	101	109	110	116	117	124	-	86	86	88	90	89	87	82	66	68
41	380714	-	150	148	150	146	142	140	140	144	144	138	142	140	-	-	92	90	92	90	88	82	86	89	89
42	1569844	-	134	130	127	127	117	120	122	126	119	120	120	-	-	-	90	90	84	82	76	72	70	77	77
43	1569828	-	140	140	136	140	138	140	138	128	138	130	130	-	-	-	90	80	70	80	68	70	80	90	70
44	1570423	-	120	124	114	108	90	82	88	108	92	102	101	-	-	-	85	62	54	54	35	35	38	59	42
45	1565444	-	135	135	128	126	125	110	90	126	112	120	123	121	-	-	90	99	77	78	77	63	56	70	67
46	1572073	-	150	146	140	142	138	139	138	136	134	134	138	137	135	-	100	98	96	90	82	84	80	89	86
47	1569718	-	123	121	126	128	134	139	134	133	126	129	126	-	-	-	79	84	80	82	89	83	81	81	80
48	1522895	73	133	127	130	132	126	130	130	132	135	120	130	132	135	132	87	85	76	79	80	62	64	71	66
49	1576762	-	130	132	134	128	126	120	121	126	120	123	126	-	-	-	86	84	80	79	72	81	82	81	80
50	1464462	-	126	130	121	116	101	97	110	113	122	127	124	120	124	-	80	81	78	70	68	62	67	63	64

Sr. No.	MRD NUMBER	DBP 30MIN	DBP 45MIN	DBP 60MIN	DBP 75MIN	DBP 90MIN	MAP BASELINE	MAP 0MIN	MAP 1MIN	MAP 2MIN	MAP 3MIN	MAP 4MIN	MAP 5MIN	MAP 10MIN	MAP 15MIN	MAP 30MIN	MAP 45MIN	MAP 60MIN	MAP 75MIN	MAP 90MIN	SPO2 BASELINE	SPO2 0MIN	SPO2 1MIN	SPO2 2MIN
1	555096	76	72	73	-	-	103	101	96	98	99	89	93	93	93	91	88	91	-	-	99	99	99	99
2	1203914	60	60	74	-	-	104	106	105	93	85	81	74	81	68	77	82	91	-	-	99	99	99	99
3	7092	74	77	81	96	83	107	117	115	107	96	100	97	97	98	89	95	98	109	107	97	99	98	97
4	1499773	66	60	75	-	-	101	96	93	92	95	94	94	91	85	86	82	97	-	-	99	99	99	99
5	1525770	70	72	-	-	-	79	77	77	79	81	82	82	81	81	83	85	87	-	-	99	99	99	99
6	1422679	72	78	67	70	78	95	122	111	89	88	87	82	75	86	87	84	81	82	83	100	100	100	100
7	1622829	75	65	70	-	-	89	95	92	86	80	70	66	60	57	92	89	92	-	-	99	99	98	98
8	1520279	66	70	-	-	-	101	97	93	88	89	92	92	100	87	93	-	-	-	-	100	100	100	97
9	1371506	68	64	68	81	-	98	109	107	89	92	87	89	92	95	89	87	89	105	-	98	98	99	98
10	1525922	86	78	-	-	-	103	97	93	91	91	90	95	98	103	105	106	-	-	-	99	98	99	99
11	1582357	70	71	68	67	-	78	65	61	74	83	87	82	81	88	89	95	90	90	-	99	99	99	99
12	1722847	68	67	-	-	-	92	98	89	85	81	82	87	85	86	85	88	-	-	-	99	99	99	99
13	1728977	74	73	-	-	-	100	103	97	95	92	93	92	92	88	86	89	-	-	-	100	100	100	100
14	1711255	76	71	71	-	-	102	107	101	106	102	102	98	101	96	93	94	97	-	-	100	100	100	100
15	1573795	74	74	80	80	-	99	102	109	103	102	97	94	93	98	87	86	100	91	-	98	98	99	98
16	1723934	62	64	-	-	-	96	97	79	53	43	74	76	68	79	75	76	78	-	-	100	100	100	98
17	1723903	72	76	72	-	-	103	108	93	86	83	80	81	57	83	87	92	89	-	-	100	99	98	98
18	1533134	94	98	94	95	-	117	113	119	122	120	111	121	117	111	110	120	114	114	-	99	99	98	99
19	1533078	77	71	66	64	60	102	89	88	83	86	87	95	93	94	89	83	82	72	78	97	97	97	97
20	1533704	67	69	70	-	-	105	105	96	83	80	80	90	84	79	79	82	85	-	-	100	100	100	100
21	1533799	54	58	-	-	-	95	86	82	72	63	69	65	74	69	63	72	-	-	-	98	98	97	98
22	1506922	63	61	-	-	-	95	89	78	80	85	87	81	79	86	85	89	-	-	-	100	100	100	100
23	1532795	60	50	60	62	64	87	87	79	77	77	82	76	72	70	73	76	77	77	75	100	100	100	100
24	1534802	48	63	64	59	-	91	93	101	95	94	88	97	84	88	75	101	100	99	-	100	100	100	100
25	1535909	77	80	82	82	-	103	97	101	101	96	97	99	104	95	97	108	110	112	-	97	97	98	98
26	1536441	78	78	-	-	-	101	104	98	99	101	81	87	83	85	93	96	-	-	-	100	100	100	100
27	1538173	69	70	68	71	-	93	84	83	63	65	66	83	85	84	84	90	85	90	-	97	97	100	100
28	77616	73	73	70	-	-	99	89	77	74	80	83	86	84	84	85	83	82	-	-	99	99	97	97
29	1539417	72	75	74	75	76	105	103	98	97	90	88	87	93	91	88	90	91	90	92	99	99	99	99
30	1169282	71	66	64	60	-	102	89	88	83	86	87	92	93	94	85	83	82	72	-	97	97	97	97
31	1539532	54	58	64	65	-	95	86	82	72	63	69	65	74	69	63	72	73	73	-	98	98	98	98
32	1482822	67	69	70	-	-	105	105	96	83	80	80	89	84	78	79	82	85	-	-	99	98	99	99
33	1532143	73	72	-	-	-	99	89	77	74	80	83	86	84	85	85	83	-	-	-	99	99	97	98
34	1449282	84	84	88	88	86	117	116	107	109	104	103	98	86	103	99	101	109	108	108	99	99	99	99
35	1538306	72	61	65	-	-	90	91	84	95	94	87	85	92	82	88	87	90	-	-	99	99	99	99
36	1475162	60	62	64	66	-	96	97	79	53	43	74	77	68	79	74	76	78	80	-	100	100	100	98
37	1536290	72	76	-	-	-	103	108	93	86	83	80	81	56	83	87	92	-	-	-	100	100	100	100
38	1548518	87	86	-	-	-	117	116	107	109	104	103	97	86	103	102	102	-	-	-	99	99	99	99
39	1470289	62	65	70	-	-	96	98	95	93	91	92	90	83	88	81	93	94	-	-	100	100	100	100
40	1515291	70	69	70	80	-	99	99	101	103	103	102	101	78	82	83	76	82	92	-	98	98	97	98
41	380714	79	80	82	-	-	111	109	111	109	106	101	104	107	107	99	106	104	-	-	98	98	98	98
42	1569844	72	72	-	-	-	105	103	98	97	90	88	87	93	91	88	92	-	-	-	99	99	99	99
43	1569828	70	70	-	-	-	107	100	92	100	91	93	99	103	93	90	92	-	-	-	100	99	100	100
44	1570423	45	48	-	-	-	97	83	74	72	53	51	55	75	59	64	69	-	-	-	99	99	99	98
45	1565444	65	62	64	-	-	105	111	94	94	93	79	67	89	82	83	82	83	-	-	99	99	99	99
46	1572073	82	81	80	79	-	117	114	111	107	101	102	99	105	102	99	100	99	98	-	100	100	100	100
47	1569718	83	73	-	-	-	94	96	95	97	104	102	99	98	95	98	97	-	-	-	99	99	99	98
48	1522895	71	64	71	78	71	102	99	94	97	95	85	86	91	89	87	92	101	106	101	98	97	98	98
49	1576762	78	79	-	-	-	101	100	98	95	90	94	95	96	93	93	95	-	-	-	100	100	100	99
50	1464462	65	69	71	70	-	95	97	92	85	79	74	81	80	83	86	87	89	87	-	98	98	99	98

Sr. No.	MRD NUMBER	SPO2 3MIN	SPO2 4MIN	SPO2 5MIN	SPO2 10MIN	SPO2 15MIN	SPO2 30MIN	SPO2 45MIN	SPO2 60MIN	SPO2 75MIN	SPO2 90MIN	HYPOTENSION	BRADYCARDIA	SL 0MIN	SL 5MIN	SL 10MIN	SL 15MIN	SL 30MIN	SL 45MIN	SL 60MIN	SL 75MIN	SL 90MIN	MBS 0MIN
1	555096	99	99	99	99	99	99	99	99	-	-	NO	NO	T12	T4	T4	T4	T4	T4	T4	T6	-	0
2	1203914	99	99	99	99	99	99	99	100	-	-	YES	NO	T12	T10	T6	T4	T4	T4	T4	T6	-	0
3	7092	98	98	97	97	97	98	97	97	-	-	NO	NO	T12	T10	T8	T4	T4	T4	T4	T6	T6	0
4	1499773	99	99	99	99	99	99	99	99	-	-	no	no	T12	T10	T10	T10	T8	T8	T8	-	-	0
5	1525770	99	99	99	98	99	98	98	99	-	-	NO	NO	L2	T10	T8	T6	T6	T6	T8	-	-	0
6	1422679	100	100	100	100	100	100	100	100	100	100	NO	NO	T10	T8	T6	T4	T4	T4	T4	T6	T6	0
7	1622829	99	100	100	98	99	99	98	99	98	-	YES	NO	T12	T10	T8	T4	T4	T6	T10	-	-	0
8	1520279	98	96	97	99	99	100	100	-	-	-	NO	NO	T12	T8	T6	T6	T6	-	-	-	-	0
9	1371506	97	98	96	98	98	99	99	99	98	-	NO	NO	T12	T10	T8	T4	T4	T6	T8	T8	-	0
10	1525922	98	99	99	99	99	99	99	-	-	-	NO	NO	T12	T12	T10	T6	T6	T6	-	-	-	0
11	1582357	100	99	100	99	99	99	100	99	99	-	YES	NO	T12	T6	T4	T4	T4	T4	T6	-	-	0
12	1722847	99	98	98	98	99	99	98	-	-	-	NO	NO	L2	T12	T12	T10	T8	T8	-	-	-	0
13	1728977	100	100	100	100	100	100	100	-	-	-	NO	NO	T12	T12	T10	T8	T8	T8	T8	-	-	0
14	1711255	100	100	100	100	100	100	100	100	-	-	NO	NO	T12	T10	T4	T4	T4	T4	T6	-	-	0
15	1573795	100	100	100	100	100	100	100	100	100	-	NO	NO	T12	T10	T6	T6	T4	T4	T4	T4	-	0
16	1723934	97	97	98	99	96	97	98	97	-	-	YES	NO	L2	T12	T12	T10	T8	T8	T8	-	-	0
17	1723903	99	98	97	98	98	98	98	99	-	-	YES	NO	T12	T10	T6	T4	T4	T4	T6	-	-	0
18	1533134	99	99	99	99	98	99	99	98	98	-	NO	NO	T12	T12	T10	T8	T6	T6	T6	T8	-	0
19	1533078	98	97	97	97	98	96	97	97	98	98	NO	NO	T12	T6	T4	T4	T4	T4	T4	T6	T8	0
20	1533704	100	99	100	100	99	100	100	100	-	-	NO	NO	T12	T12	T10	T4	T4	T4	T4	T6	-	0
21	1533799	98	98	97	98	99	98	100	-	-	-	YES	NO	L2	T12	T10	T6	T6	T6	-	-	-	0
22	1506922	100	100	100	100	100	100	100	-	-	-	NO	NO	T12	T12	T10	T4	T4	T4	-	-	-	0
23	1532795	100	100	100	100	100	100	100	100	100	100	NO	NO	T12	T10	T4	T4	T4	T4	T6	T6	T6	0
24	1534802	100	100	100	100	100	100	100	100	100	-	NO	YES	T12	T12	T10	T6	T6	T6	T6	T6	-	0
25	1535909	98	98	99	98	99	99	99	98	98	-	NO	NO	T12	T10	T6	T4	T4	T4	T6	T6	-	0
26	1536441	100	100	100	100	100	100	100	-	-	-	NO	NO	T12	T6	T4	T4	T4	T4	-	-	-	0
27	1538173	100	99	99	96	97	97	100	100	100	-	YES	NO	L2	T12	T10	T6	T6	T6	T6	T6	-	0
28	77616	97	97	98	97	99	98	97	97	-	-	NO	NO	T12	T12	T10	T6	T6	T6	T6	-	-	0
29	1539417	99	99	99	99	99	99	99	99	99	99	NO	NO	T12	T6	T4	T4	T4	T4	T4	T6	T6	0
30	1169282	97	98	97	97	97	97	97	97	97	-	NO	NO	T12	T10	T6	T6	T6	T6	T8	T8	-	0
31	1539532	98	97	98	98	97	99	100	100	100	-	YES	NO	T12	T8	T4	T4	T4	T4	T6	T6	-	0
32	1482822	99	99	99	99	99	99	99	99	-	-	NO	NO	T12	T10	T6	T6	T6	T6	T6	-	-	0
33	1532143	97	99	98	98	99	99	99	-	-	-	NO	NO	T12	T8	T6	T6	T6	T6	-	-	-	0
34	1449282	99	99	99	99	99	99	99	99	99	99	NO	NO	L2	T10	T6	T4	T4	T4	T4	T4	T6	0
35	1538306	98	98	99	99	99	99	98	99	-	-	NO	NO	T12	T12	T8	T6	T6	T6	T6	-	-	0
36	1475162	97	97	97	98	99	97	96	98	97	-	YES	NO	T12	T6	T4	T4	T4	T4	T4	T6	-	0
37	1536290	100	100	100	100	100	100	100	-	-	-	YES	NO	T12	T8	T6	T4	T4	T4	-	-	-	0
38	1548518	99	99	99	99	99	99	99	-	-	-	NO	NO	T12	T8	T4	T4	T4	T4	-	-	-	0
39	1470289	100	100	100	100	100	100	100	100	-	-	NO	NO	T12	T8	T6	T6	T6	T6	T6	-	-	0
40	1515291	97	99	99	98	99	98	99	99	98	-	NO	NO	L2	T12	T8	T4	T4	T4	T6	T6	-	0
41	380714	99	99	99	99	99	98	98	98	-	-	NO	NO	T12	T8	T6	T6	T6	T6	-	-	-	0
42	1569844	99	99	99	99	99	99	99	-	-	-	NO	NO	T12	T8	T4	T4	T4	T4	-	-	-	0
43	1569828	100	99	100	100	100	99	99	-	-	-	NO	NO	T12	T10	T6	T6	T6	T6	-	-	-	0
44	1570423	98	97	97	97	99	99	98	-	-	-	YES	NO	T12	T8	T4	T4	T4	T4	-	-	-	0
45	1565444	99	99	99	99	99	99	99	99	-	-	NO	NO	T12	T8	T4	T4	T4	T4	T6	-	-	0
46	1572073	100	100	100	100	100	100	100	100	100	-	NO	NO	L2	T12	T8	T6	T6	T6	T6	T8	-	0
47	1569718	98	98	98	98	99	99	98	-	-	-	NO	NO	T12	T8	T6	T6	T6	T6	-	-	-	0
48	1522895	98	98	97	98	98	98	97	98	98	99	NO	NO	L2	T8	T4	T4	T4	T4	T6	T6	T8	0
49	1576762	99	98	98	99	99	99	98	-	-	-	NO	NO	T12	T8	T4	T4	T4	T4	-	-	-	0
50	1464462	98	97	97	98	98	97	98	98	99	-	NO	NO	L2	T12	T8	T6	T6	T6	T8	T8	-	0

Sr. No.	MRD NUMBER	MBS 5MIN	MBS 10MIN	MBS 15MIN	MBS 30MIN	MBS 45MIN	MBS 60MIN	MBS 75MIN	MBS 90MIN	MAX SL	MAX MBS	POST HR 0min	POST HR 15MINS	POST HR 30MINS	POST HR 45MIN	POST HR 60MIN	POST HR 2HRS	POST HR 3HRS	POST HR 4HRS	POST HR 5HRS	POST HR 6HRS	POST SPB 0MINS	POST SBP 15MINS
1	555096	3	3	3	3	3	3	3	-	T4	3	84	86	90	91	85	91	84	81	82	84	120	125
2	1203914	3	3	3	3	3	3	2	-	T4	3	60	63	64	66	66	64	62	60	62	64	132	122
3	7092	3	3	3	3	3	3	2	1	T4	3	72	74	74	75	75	74	71	78	80	76	140	138
4	1499773	0	0	1	2	2	2	-	-	T8	3	68	65	63	64	65	64	65	64	68	64	117	129
5	1525770	2	3	3	3	3	3	-	-	T6	3	64	63	62	57	62	64	63	64	65	64	110	106
6	1422679	3	3	3	3	3	3	3	2	T4	3	82	84	82	86	84	94	90	94	90	92	102	110
7	1622829	2	3	3	3	3	2	-	-	T4	3	78	74	74	74	78	78	79	79	74	72	120	122
8	1520279	3	3	3	3	-	-	-	-	T4	3	65	74	78	74	80	84	80	74	74	78	140	136
9	1371506	3	3	3	3	3	3	3	-	T4	3	81	84	80	78	80	84	78	84	79	80	136	134
10	1525922	0	2	3	3	3	-	-	-	T4	3	67	69	70	68	66	69	68	70	65	68	142	148
11	1582357	3	3	3	3	3	3	3	-	T4	3	62	64	64	64	66	62	70	71	72	68	118	116
12	1722847	0	2	3	3	3	-	-	-	T8	3	69	71	68	72	71	74	74	76	71	72	116	112
13	1728977	0	3	3	3	3	3	-	-	T8	3	72	74	89	80	86	112	82	86	80	88	110	112
14	1711255	3	3	3	3	3	3	-	-	T4	3	82	84	86	84	86	78	78	82	89	92	140	142
15	1573795	0	2	3	3	3	3	3	-	T4	3	80	82	84	86	84	84	82	80	84	90	122	126
16	1723934	0	0	0	0	1	1	-	-	T8	1	110	108	110	112	100	110	108	105	102	103	110	112
17	1723903	3	3	3	3	3	2	-	-	T4	3	89	86	89	90	92	90	84	86	82	83	128	124
18	1533134	1	3	3	3	3	3	3	-	T6	3	84	86	88	85	84	90	86	88	89	94	150	146
19	1533078	3	3	3	3	3	3	3	2	T4	3	85	86	88	92	90	90	92	94	96	88	133	134
20	1533704	2	3	3	3	3	2	-	-	T4	3	96	100	102	100	101	98	92	94	96	98	118	122
21	1533799	3	3	3	3	3	-	-	-	T4	3	90	92	90	89	86	84	86	84	88	92	124	126
22	1506922	0	3	3	3	3	-	-	-	T4	3	70	60	64	70	68	67	66	70	72	74	126	124
23	1532795	3	3	3	3	3	3	2	2	T4	3	63	69	72	70	72	74	76	78	76	78	110	112
24	1534802	1	3	3	3	3	3	3	-	T4	3	54	58	56	58	68	54	56	57	56	54	132	134
25	1535909	3	3	3	3	3	3	2	-	T4	3	82	84	88	90	76	73	68	86	96	86	142	144
26	1536441	3	3	3	3	3	-	-	-	T4	3	78	80	82	78	76	74	72	76	80	82	128	122
27	1538173	0	2	3	3	3	3	2	-	T4	3	82	84	79	78	86	84	90	88	89	92	128	130
28	77616	3	3	3	3	3	3	-	-	T6	3	70	73	76	74	80	78	76	82	80	84	105	110
29	1539417	3	3	3	3	3	3	3	3	T4	3	93	94	92	93	94	92	95	95	93	97	126	126
30	1169282	2	3	3	3	3	3	2	-	T6	3	85	86	88	92	93	90	92	94	96	88	133	134
31	1539532	3	3	3	3	3	3	3	-	T4	3	90	92	90	89	86	84	86	84	88	92	124	126
32	1482822	2	3	3	3	3	3	-	-	T4	3	96	100	102	100	101	98	92	94	96	98	116	120
33	1532143	3	3	3	3	3	-	-	-	T6	3	70	73	76	74	80	76	78	82	80	84	107	112
34	1449282	2	3	3	3	3	2	2	2	T4	3	70	72	69	72	70	74	80	88	79	89	130	122
35	1538306	2	3	3	3	3	3	-	-	T6	3	83	80	80	82	81	80	78	76	74	78	124	110
36	1475162	3	3	3	3	2	2	2	-	T4	3	110	108	110	112	100	110	108	105	102	103	112	110
37	1536290	3	3	3	3	3	-	-	-	T4	3	89	86	89	90	92	90	84	86	82	83	126	122
38	1548518	3	3	3	3	3	-	-	-	T4	3	71	72	67	70	72	75	82	88	79	87	125	131
39	1470289	3	3	3	3	3	3	-	-	T4	3	80	82	84	86	84	88	82	80	84	90	120	124
40	1515291	2	3	3	3	3	2	2	-	T4	3	102	102	104	102	108	110	111	109	108	108	142	142
41	380714	3	3	3	3	3	-	-	-	T4	3	70	68	69	70	72	74	70	64	62	63	140	146
42	1569844	3	3	3	3	3	-	-	-	T4	3	93	94	92	93	94	92	94	96	93	97	126	126
43	1569828	3	3	3	3	3	-	-	-	T4	3	70	74	72	72	74	76	75	80	71	75	130	132
44	1570423	3	3	3	3	3	-	-	-	T4	3	94	95	98	100	106	98	104	99	106	102	117	107
45	1565444	3	3	3	3	2	2	-	-	T4	3	82	80	72	74	76	77	78	78	76	74	130	123
46	1572073	2	3	3	3	3	2	2	-	T6	3	72	74	80	82	80	92	96	101	98	97	132	136
47	1569718	3	3	3	3	3	-	-	-	T4	3	70	70	72	74	73	72	70	68	70	72	120	118
48	1522895	3	3	3	3	3	2	2	0	T4	3	70	65	68	70	72	66	68	69	71	70	128	122
49	1576762	3	3	3	3	3	-	-	-	T4	3	87	83	84	86	92	96	92	80	85	82	132	128
50	1464462	3	3	3	3	3	3	2	-	T6	3	85	86	84	82	78	84	85	81	74	75	122	120

Sr. No.	MRD NUMBER	POST SBP 30MINS	POST SBP 45MINS	POST SBP 60MINS	POST SBP 2HRS	POST SBP 3HRS	POST SBP 4HRS	POST SBP 5HRS	POST SBP 6HRS	POST DBP 0MINS	POST DBP 15MINS	POST DBP 30MINS	POST DBP 45MINS	POST DBP 60MINS	POST DBP 2HRS	POST DBP 3HRS	POST DBP 4HRS	POST DBP 5HRS	POST DBP 6HRS	POST MAP 0MINS	POST MAP 15MINS	POST MAP 30MINS
1	555096	126	121	119	124	122	122	130	130	68	71	70	65	68	70	74	74	72	70	85	89	89
2	1203914	140	138	136	140	132	140	138	140	70	80	80	90	78	90	78	90	70	90	91	94	100
3	7092	130	138	132	136	138	132	128	140	79	80	80	78	73	70	80	70	70	80	99	99	97
4	1499773	135	128	143	121	128	129	130	114	73	79	86	79	91	74	80	80	88	76	88	96	102
5	1525770	108	112	115	107	116	121	117	109	62	67	62	64	65	63	65	69	64	62	78	80	77
6	1422679	102	103	120	130	130	120	130	130	62	60	60	64	64	84	80	80	80	80	75	77	74
7	1622829	110	122	126	118	128	126	122	128	64	65	65	74	75	67	75	65	64	71	83	84	80
8	1520279	136	134	134	138	138	140	142	140	90	88	90	80	76	78	74	78	78	79	107	104	105
9	1371506	138	131	134	145	134	132	131	128	72	71	72	74	69	88	67	72	70	65	93	92	94
10	1525922	138	145	141	134	142	145	141	145	78	71	74	81	74	70	76	80	81	82	99	97	95
11	1582357	116	120	118	116	114	120	124	128	62	64	62	66	68	65	61	64	69	72	81	81	80
12	1722847	121	124	121	118	114	127	121	122	68	64	66	68	70	61	60	70	65	71	84	80	84
13	1728977	120	124	116	122	116	124	120	128	68	70	78	82	74	80	78	82	80	86	82	84	92
14	1711255	149	148	130	132	136	142	146	146	82	84	90	89	78	79	80	84	84	88	101	103	110
15	1573795	128	132	134	138	130	140	132	138	80	84	84	82	84	88	82	90	84	88	94	98	99
16	1723934	114	110	116	128	116	130	124	118	66	68	70	70	68	86	70	90	82	70	81	83	85
17	1723903	120	116	124	118	126	130	129	132	72	70	68	68	72	70	76	80	78	84	91	88	85
18	1533134	144	140	138	142	134	134	136	140	98	94	92	90	89	90	86	84	86	90	115	111	109
19	1533078	138	140	142	140	138	138	142	138	88	89	89	89	90	90	80	82	89	80	103	104	105
20	1533704	124	126	130	132	136	130	128	132	70	71	76	80	70	76	84	78	80	80	86	88	92
21	1533799	120	124	126	130	130	130	128	126	76	80	72	74	76	84	82	82	80	78	92	95	88
22	1506922	120	118	114	124	126	130	132	124	72	70	70	68	70	78	80	80	82	70	90	88	87
23	1532795	120	124	120	118	124	126	124	120	73	70	72	76	72	70	72	74	72	80	85	84	88
24	1534802	130	132	148	134	144	142	138	140	80	82	80	82	90	83	89	89	80	86	97	99	97
25	1535909	142	148	150	160	140	140	148	142	82	80	84	90	90	100	86	80	80	82	102	101	103
26	1536441	124	128	126	134	130	130	126	128	76	70	72	74	76	80	78	76	76	74	93	87	89
27	1538173	132	130	126	134	138	132	142	138	82	84	82	80	78	86	86	88	90	90	97	99	99
28	77616	109	110	112	110	113	118	118	118	72	73	72	72	76	72	76	74	82	76	83	85	84
29	1539417	130	128	128	124	132	128	130	132	76	72	78	76	78	72	80	78	82	80	93	90	95
30	1169282	138	140	142	140	138	138	142	137	88	89	89	90	90	90	80	82	89	80	103	104	105
31	1539532	120	124	126	130	130	130	128	126	76	80	72	74	76	84	82	80	80	78	92	95	88
32	1482822	124	126	130	132	134	130	128	132	70	71	76	80	70	76	84	78	80	80	85	87	92
33	1532143	109	110	112	110	114	118	116	114	72	73	72	72	76	72	72	76	74	70	84	86	84
34	1449282	114	116	112	120	122	124	126	138	85	80	76	78	72	80	82	84	84	92	100	94	89
35	1538306	100	104	110	110	124	116	124	116	71	72	73	70	72	74	74	72	72	70	89	85	82
36	1475162	109	110	112	112	112	118	116	120	68	67	61	65	70	71	68	69	71	72	83	81	77
37	1536290	120	116	124	118	124	130	128	132	72	70	68	68	72	70	76	80	78	84	90	87	85
38	1548518	114	112	116	123	125	125	123	127	84	83	79	-	76	79	81	81	83	84	98	99	91
39	1470289	128	132	134	138	128	124	132	138	80	84	84	85	84	88	82	90	84	88	93	97	99
40	1515291	142	138	142	138	140	140	138	136	78	80	82	80	86	82	78	82	82	84	99	101	102
41	380714	142	140	138	140	140	146	144	136	82	89	80	82	82	82	80	89	82	82	101	108	101
42	1569844	130	128	128	124	132	128	130	132	76	72	78	76	78	72	80	79	82	80	93	90	95
43	1569828	140	135	128	130	127	136	132	126	78	80	85	80	78	75	75	80	80	81	95	97	103
44	1570423	118	120	120	124	120	122	118	120	66	64	70	72	80	82	80	82	78	80	83	78	86
45	1565444	119	120	126	127	125	118	121	119	70	65	68	70	71	71	69	65	66	68	90	84	85
46	1572073	128	121	129	128	130	138	140	148	72	70	76	70	72	74	76	80	96	92	92	92	93
47	1569718	119	120	121	123	124	130	126	126	70	69	68	70	73	70	69	72	69	71	87	85	85
48	1522895	118	128	132	128	126	125	126	128	65	61	59	62	68	65	66	66	70	71	86	81	79
49	1576762	128	124	125	126	121	123	125	128	82	81	83	81	81	80	79	78	71	78	99	97	98
50	1464462	125	110	109	120	124	128	129	121	78	71	74	65	66	70	69	68	71	70	93	87	91

Sr. No.	MRD NUMBER	POST MAP 45MINS	POST MAP 60MINS	POST MAP 2HRS	POST MAP 3HRS	POST MAP 4HRS	POST MAP 5HRS	POST MAP 6HRS	POST SPO2 0MINS	POST SPO2 15MINS	POST SPO2 30MINS	POST SPO2 45MINS	POST SPO2 60MINS	POST SPO2 2HRS	POST SPO2 3HRS	POST SPO2 4HRS	POST SPO2 5HRS	POST SPO2 6HRS	POST VAS 0MINS	POST VAS 15MINS	POST VAP 30MINS
1	555096	84	85	88	90	90	91	90	99	98	99	99	99	99	99	99	98	99	0	0	0
2	1203914	106	97	107	96	107	93	107	99	99	99	99	100	99	99	99	99	99	0	0	0
3	7092	98	93	92	99	91	89	100	98	98	98	97	97	97	97	98	99	99	2	2	2
4	1499773	95	108	90	96	96	102	89	99	99	99	99	99	99	99	99	99	99	0	0	0
5	1525770	80	82	78	82	86	82	78	99	99	99	98	99	99	99	100	98	99	0	0	2
6	1422679	77	83	99	97	93	97	97	96	97	96	96	96	97	99	98	97	98	0	0	0
7	1622829	90	92	84	93	85	83	90	99	99	99	98	99	98	99	98	99	99	0	0	0
8	1520279	98	95	98	95	99	99	99	99	99	99	99	99	98	98	99	97	98	0	0	0
9	1371506	93	91	107	89	92	90	86	97	98	99	98	98	97	98	99	98	98	0	0	0
10	1525922	102	96	91	98	102	101	103	98	98	99	99	99	99	99	99	99	98	0	0	0
11	1582357	84	85	82	79	83	87	91	99	99	99	99	99	99	98	99	100	100	0	0	0
12	1722847	87	87	80	78	89	84	88	98	99	99	99	97	98	99	99	98	99	0	0	0
13	1728977	96	88	94	91	96	93	100	100	100	100	100	100	99	99	100	100	100	0	0	0
14	1711255	109	95	97	99	103	105	107	100	100	100	100	100	100	100	100	100	100	0	0	0
15	1573795	99	101	105	98	107	100	105	100	100	100	100	100	100	100	100	100	100	0	0	0
16	1723934	83	84	100	85	103	96	86	98	98	99	99	98	100	100	100	99	100	0	0	0
17	1723903	84	89	86	93	97	95	100	99	99	99	98	98	99	98	98	98	98	0	0	0
18	1533134	107	105	107	102	101	103	107	99	99	99	99	99	99	99	99	99	99	0	0	0
19	1533078	106	107	107	99	101	107	99	99	99	99	99	99	99	99	99	99	99	0	0	0
20	1533704	95	90	95	101	95	96	97	99	99	99	98	98	99	99	99	98	99	0	0	0
21	1533799	91	93	99	98	98	96	94	100	100	100	100	100	100	100	99	99	100	0	0	0
22	1506922	85	85	93	95	97	99	88	100	100	100	100	99	100	99	99	100	100	0	0	0
23	1532795	92	88	86	89	91	89	93	100	100	99	99	100	100	100	100	100	100	0	0	0
24	1534802	99	109	100	107	107	99	104	100	100	99	99	100	99	100	99	100	100	0	0	0
25	1535909	109	110	120	104	100	103	102	97	97	98	99	99	99	98	98	97	98	0	0	0
26	1536441	92	93	98	95	94	93	92	100	100	100	100	100	100	100	100	100	100	0	0	0
27	1538173	97	94	102	103	103	107	106	100	100	100	100	100	100	100	100	100	100	0	0	0
28	77616	85	88	85	88	89	94	90	97	98	99	97	99	99	99	99	99	99	0	0	0
29	1539417	93	95	89	97	95	98	97	100	100	100	100	100	100	100	100	100	100	0	0	0
30	1169282	107	107	107	99	101	107	99	97	98	98	98	99	99	99	99	99	99	0	0	0
31	1539532	91	93	99	98	97	96	94	100	100	100	100	100	100	100	100	100	100	0	0	0
32	1482822	95	90	95	101	95	96	97	99	99	99	99	99	99	99	99	99	99	0	0	0
33	1532143	85	88	85	86	90	88	85	99	98	99	99	98	98	99	99	98	98	0	0	0
34	1449282	91	85	93	95	97	98	107	99	99	99	99	99	99	99	99	99	99	0	0	0
35	1538306	81	85	86	91	87	89	85	99	99	99	99	99	99	99	99	99	99	0	0	0
36	1475162	80	84	85	83	85	86	88	98	98	99	99	98	98	99	99	99	99	0	0	0
37	1536290	84	89	86	92	97	95	100	100	100	100	100	100	100	100	100	100	100	0	0	0
38	1548518	#VALUE!	89	94	96	96	96	98	99	99	99	99	99	99	99	98	98	98	0	0	0
39	1470289	101	101	105	97	101	100	105	100	100	100	100	100	100	100	100	100	100	0	0	0
40	1515291	99	105	101	99	101	101	101	98	98	98	98	97	98	98	98	98	98	0	0	0
41	380714	101	101	101	100	108	103	100	99	99	99	99	99	99	99	99	99	99	0	0	0
42	1569844	93	95	89	97	95	98	97	100	100	100	100	100	100	100	100	100	100	0	0	0
43	1569828	98	95	93	92	99	97	96	100	100	99	99	100	100	99	99	100	99	0	0	0
44	1570423	88	93	96	93	95	91	93	99	99	99	99	99	99	99	99	99	99	0	0	0
45	1565444	87	89	90	88	83	84	85	99	98	99	98	98	99	99	99	99	99	0	0	0
46	1572073	87	91	92	94	99	111	111	100	100	100	100	100	100	100	100	100	100	0	0	0
47	1569718	87	89	88	87	91	88	89	99	99	98	99	98	99	98	98	98	98	0	0	0
48	1522895	84	89	86	86	86	89	90	99	99	99	99	99	99	99	99	99	99	0	0	0
49	1576762	95	96	95	93	93	89	95	99	99	99	98	98	99	98	98	98	98	0	0	0
50	1464462	80	80	87	87	88	90	87	99	99	99	99	98	98	98	99	98	98	0	0	0

Sr. No.	MRD NUMBER	POST VAS 45MINS	POST VAS 60MINS	POST VAS 90MIN	POST VAS 2HRS	POST VAS 150MINS	POST VAS 3HRS	POST VAS 4HRS	POST VAS 5HRS	POST VAS 6HRS	DURATION OF ANALGESIA	POST SL 0MINS	POST SL 60MINS	POST SL 120MINS	POST SL 150MINS	POST SL 3HRS	POST SL 4HRS	POST SL 5HRS	POST SL 6HRS	POST MBS 0MINS	POST MBS 60MINS
1	555096	2	2	5	-	-	-	-	-	-	150	T6	T10	T12	-	-	-	-	-	3	3
2	1203914	0	0	1	2	6	-	-	-	-	210	T8	T10	T12	-	-	-	-	-	2	2
3	7092	6	-	-	-	-	-	-	-	-	125	T6	T12	-	-	-	-	-	-	1	0
4	1499773	2	2	2	5	-	-	-	-	-	162	T8	T10	T12	-	-	-	-	-	2	0
5	1525770	2	2	6	-	-	-	-	-	-	146	T8	T10	T12	-	-	-	-	-	3	2
6	1422679	0	0	0	2	2	5	5	-	-	270	T8	T8	T10	T12	-	-	-	-	2	0
7	1622829	2	2	2	5	-	-	-	-	-	165	T12	-	-	-	-	-	-	-	2	0
8	1520279	0	0	0	0	0	2	6	-	-	290	T6	T6	T6	T10	T10	12	-	-	3	3
9	1371506	0	1	2	4	-	-	-	-	-	196	T10	T10	T12	-	-	-	-	-	3	0
10	1525922	0	0	1	1	1	2	5	-	-	330	T6	T6	T10	T12	-	-	-	-	3	3
11	1582357	0	0	0	1	1	3	4	-	-	300	T8	T8	T12	-	-	-	-	-	3	3
12	1722847	0	1	1	1	2	5	-	-	-	240	T10	T12	-	-	-	-	-	-	2	0
13	1728977	1	1	2	2	4	-	-	-	-	195	T10	T12	-	-	-	-	-	-	3	2
14	1711255	0	0	0	0	1	1	4	-	-	300	T6	T6	T12	-	-	-	-	-	3	2
15	1573795	0	0	0	0	1	2	4	-	-	315	T6	T12	-	-	-	-	-	-	2	0
16	1723934	0	0	0	1	2	4	-	-	-	240	T8	T12	-	-	-	-	-	-	0	-
17	1723903	0	0	0	0	1	1	1	4	-	360	T6	T10	T12	-	-	-	-	-	2	0
18	1533134	0	0	1	1	2	4	-	-	-	255	T8	T12	-	-	-	-	-	-	2	2
19	1533078	0	0	2	4	-	-	-	-	-	210	T8	T10	T12	-	-	-	-	-	2	0
20	1533704	0	0	1	1	1	2	6	-	-	310	T6	T10	T12	-	-	-	-	-	2	0
21	1533799	0	0	0	0	1	2	2	4	-	345	T6	T10	T12	-	-	-	-	-	3	3
22	1506922	0	0	0	0	0	4	-	-	-	224	T4	T8	T12	-	-	-	-	-	3	2
23	1532795	0	0	1	4	-	-	-	-	-	210	T8	T12	-	-	-	-	-	-	2	0
24	1534802	0	0	0	1	1	3	4	-	-	315	T6	T10	T12	-	-	-	-	-	2	0
25	1535909	0	0	0	0	2	2	4	-	-	305	T6	T10	T12	-	-	-	-	-	2	0
26	1536441	0	0	0	0	0	0	3	2	2	405	T4	T6	T8	T12	-	-	-	-	3	3
27	1538173	0	0	1	2	4	-	-	-	-	225	T6	T10	T12	-	-	-	-	-	2	0
28	77616	0	0	0	1	2	4	-	-	-	240	T6	T6	T10	T12	-	-	-	-	3	2
29	1539417	0	0	0	0	2	5	-	-	-	270	T6	T10	T12	-	-	-	-	-	3	0
30	1169282	0	0	1	2	4	-	-	-	-	225	T8	T12	-	-	-	-	-	-	2	0
31	1539532	0	0	0	0	1	2	4	-	-	320	T6	T10	T12	-	-	-	-	-	3	0
32	1482822	0	2	2	2	4	-	-	-	-	210	T6	T10	T12	-	-	-	-	-	3	0
33	1532143	0	0	1	1	2	4	-	-	-	225	T6	T8	T12	-	-	-	-	-	3	3
34	1449282	0	1	2	2	4	-	-	-	-	220	T6	T10	T12	-	-	-	-	-	2	0
35	1538306	0	0	0	2	2	3	3	5	-	345	T8	T10	T12	-	-	-	-	-	2	0
36	1475162	0	0	0	1	1	2	4	-	-	312	T8	T12	-	-	-	-	-	-	2	0
37	1536290	0	0	0	1	1	1	2	5	-	350	T4	T10	T12	-	-	-	-	-	3	0
38	1548518	0	0	0	0	1	1	3	2	5	405	T4	T6	T10	T12	-	-	-	-	3	3
39	1470289	0	0	1	1	2	5	-	-	-	240	T6	T10	T12	-	-	-	-	-	3	0
40	1515291	0	0	1	2	2	4	-	-	-	255	T6	T12	-	-	-	-	-	-	2	0
41	380714	0	0	0	0	1	2	4	-	-	300	T6	T10	T12	-	-	-	-	-	3	0
42	1569844	0	0	0	0	0	1	3	4	-	345	T4	T10	T12	-	-	-	-	-	3	0
43	1569828	0	0	0	0	1	2	5	-	-	285	T6	T10	T12	-	-	-	-	-	3	0
44	1570423	0	0	0	0	0	1	2	4	-	320	T4	T10	T12	-	-	-	-	-	3	0
45	1565444	0	0	0	0	1	2	4	-	-	300	T6	T10	T12	-	-	-	-	-	2	0
46	1572073	0	0	0	0	1	2	4	-	-	320	T8	T12	-	-	-	-	-	-	2	0
47	1569718	0	0	0	2	2	4	-	-	-	225	T6	T10	T12	-	-	-	-	-	3	0
48	1522895	0	0	2	2	2	4	-	-	-	270	T8	T12	-	-	-	-	-	-	0	-
49	1576762	0	0	1	1	2	4	-	-	-	230	T4	T8	T12	-	-	-	-	-	3	0
50	1464462	0	0	0	0	1	2	3	-	-	300	T8	T10	T12	-	-	-	-	-	2	0

Sr. No.	MRD NUMBER	POST MBS 120MINS	POST MBS 150MINS	POST MBS 3HRS	POST MBS 4HRS	POST MBS 5HRS	POST MBS 6HRS	TIME TO T12 LEVEL	TIME TO MBS0	ONSET OF SENSORY BLOCK	ONSET OF MOTOR BLOCK	TIME TO MAX SENSORY LEVEL	TIME TO MAX MOTOR LEVEL	TIME OF 2 SEGMENT RESRESSION FROM MAX BLOCK HEIGHT
1	555096	2	0	-	-	-	-	180	190	5	5	5	5	67
2	1203914	0	-	-	-	-	-	120	110	3	5	15	5	70
3	7092	-	-	-	-	-	-	140	140	10	5	30	5	65
4	1499773	-	-	-	-	-	-	110	50	5	25	27	25	70
5	1525770	0	-	-	-	-	-	150	130	5	8	12	10	55
6	1422679	-	-	-	-	-	-	250	160	3	4	12	3	70
7	1622829	-	-	-	-	-	-	120	135	2	2	14	10	40
8	1520279	3	3	2	0	-	-	210	170	2	2	8	2	90
9	1371506	-	-	-	-	-	-	195	125	4	5	12	5	50
10	1525922	3	2	0	-	-	-	180	140	9	10	13	14	100
11	1582357	1	0	-	-	-	-	170	130	2	5	8	5	60
12	1722847	-	-	-	-	-	-	120	110	14	10	25	15	45
13	1728977	0	-	-	-	-	-	105	105	10	9	13	9	60
14	1711255	0	-	-	-	-	-	175	160	2	8	10	2	55
15	1573795	-	-	-	-	-	-	190	135	3	10	20	15	70
16	1723934	-	-	-	-	-	-	90	60	15	35	25	35	50
17	1723903	-	-	-	-	-	-	180	110	4	4	14	4	60
18	1533134	0	-	-	-	-	-	135	120	9	5	29	10	65
19	1533078	-	-	-	-	-	-	190	140	2	2	8	2	70
20	1533704	-	-	-	-	-	-	140	90	7	4	13	10	53
21	1533799	0	-	-	-	-	-	155	155	9	4	14	4	80
22	1506922	1	0	-	-	-	-	160	190	10	10	13	10	90
23	1532795	-	-	-	-	-	-	140	140	5	5	10	5	55
24	1534802	-	-	-	-	-	-	195	125	8	5	15	10	100
25	1535909	-	-	-	-	-	-	175	125	5	5	12	5	55
26	1536441	2	0	-	-	-	-	175	170	3	5	8	5	105
27	1538173	-	-	-	-	-	-	185	135	7	9	13	13	90
28	77616	0	-	-	-	-	-	210	160	6	4	12	4	110
29	1539417	-	-	-	-	-	-	160	130	3	3	7	3	65
30	1169282	-	-	-	-	-	-	135	135	5	5	9	9	50
31	1539532	-	-	-	-	-	-	175	135	5	8	10	5	60
32	1482822	-	-	-	-	-	-	170	120	5	5	8	6	70
33	1532143	0	-	-	-	-	-	180	150	5	3	9	5	90
34	1449282	-	-	-	-	-	-	170	120	5	3	12	8	65
35	1538306	-	-	-	-	-	-	165	90	8	7	15	12	70
36	1475162	-	-	-	-	-	-	135	120	5	5	10	5	60
37	1536290	-	-	-	-	-	-	165	105	5	4	12	4	65
38	1548518	2	0	-	-	-	-	180	165	2	2	8	2	55
39	1470289	-	-	-	-	-	-	160	120	3	2	9	5	90
40	1515291	-	-	-	-	-	-	135	90	9	8	13	8	50
41	380714	-	-	-	-	-	-	160	105	3	8	8	3	70
42	1569844	-	-	-	-	-	-	155	105	5	3	7	3	75
43	1569828	-	-	-	-	-	-	165	100	5	5	9	5	85
44	1570423	-	-	-	-	-	-	170	125	4	4	8	4	70
45	1565444	-	-	-	-	-	-	170	120	3	4	8	4	45
46	1572073	-	-	-	-	-	-	125	90	7	8	13	8	53
47	1569718	-	-	-	-	-	-	155	95	5	4	10	4	70
48	1522895	-	-	-	-	-	-	140	90	3	2	8	2	50
49	1576762	-	-	-	-	-	-	150	100	2	2	6	2	60
50	1464462	-	-	-	-	-	-	160	95	8	4	15	4	55

Sr. No.	MRD NUMBER	INITIALS	AGE	SEX	TREATMENT GROUP	BMI	CO-MORBIDITIES	ASA GRADE	HR BASELINE	HR 0MIN	HR 1MIN	HR 2MIN	HR 3MIN	HR 4MIN	HR 5MIN	HR 10MIN	HR 15MIN	HR 30MIN	HR 45MIN	HR 60MIN	HR 75MIN
51	1579122	CM	40	M	F	32.3	OBESE, ALCOHOIC	2	89	90	90	88	87	76	75	78	76	78	80	82	-
52	841069	HK	42	F	M	32.3	OBESE, HYPOTHYROID	2	101	112	102	92	94	95	84	86	87	90	92	87	-
53	1581435	SS	45	M	F	25.4	ALCOHOLIC, HTN	2	86	98	101	84	76	78	74	65	68	70	68	-	-
54	1449320	GS	36	M	F	23.5	NONE	1	65	67	64	65	60	62	63	62	66	64	62	61	62
55	1551414	S	23	F	M	25.4	HYPOTHYROID	2	83	86	82	81	76	72	69	65	67	71	73	74	77
56	1533799	RS	59	M	F	32	OBESITY	2	88	95	92	92	97	97	96	91	88	80	-	-	-
57	1587920	CK	40	M	F	33.8	DM2,OBESITY	2	72	80	82	86	79	76	78	80	82	80	78	-	-
58	1685408	RG	27	F	M	24.2	NONE	1	72	70	74	72	73	70	68	66	67	68	64	-	-
59	1645753	RK	18	F	M	19.5	NONE	1	92	91	90	86	80	76	72	71	69	65	68	72	75
60	1683409	DS	18	M	M	21.8	NONE	1	88	95	92	92	97	97	96	91	88	80	78	80	83

Sr. No.	MRD NUMBER	HR 90MIN	SBP BASELINE	SBP 0MIN	SBP 1MIN	SBP 2MIN	SBP 3MIN	SBP 4MIN	SBP 5MIN	SBP 10MIN	SBP 15MIN	SBP 30MIN	SBP 45MIN	SBP 60MIN	SBP 75MIN	SBP 90MIN	DBP BASELINE	DBP 0MIN	DBP 1MIN	DBP 2MIN	DBP 3MIN	DBP 4MIN	DBP 5MIN	DBP 10MIN	DBP 15MIN
51	1579122	-	124	129	123	123	124	123	120	116	119	123	120	115	-	-	72	83	71	76	72	76	76	70	71
52	841069	-	142	142	138	132	136	140	136	134	134	130	132	125	-	-	90	92	90	77	72	78	71	76	72
53	1581435	-	140	148	132	118	102	99	104	112	116	109	110	-	-	-	90	96	80	76	59	50	54	78	72
54	1449320	-	128	125	120	119	117	119	116	118	121	123	127	123	125	-	80	76	79	72	78	72	69	67	69
55	1551414	-	130	132	130	122	118	116	119	123	124	123	120	122	121	-	76	78	72	67	62	60	63	65	67
56	1533799	-	112	117	114	118	124	126	119	115	113	112	-	-	-	-	79	81	82	84	91	89	83	81	78
57	1587920	-	108	105	107	102	109	110	108	106	111	113	109	-	-	-	70	72	70	68	72	70	76	72	76
58	1685408	-	130	126	110	102	98	94	99	108	114	114	118	-	-	-	86	80	79	62	61	62	64	68	70
59	1645753	-	110	112	108	92	98	104	108	110	106	106	107	110	108	-	72	70	69	60	61	63	64	68	69
60	1683409	-	112	117	114	118	124	126	117	113	111	112	115	120	119	-	79	81	82	84	91	89	83	81	78

Sr. No.	MRD NUMBER	DBP 30MIN	DBP 45MIN	DBP 60MIN	DBP 75MIN	DBP 90MIN	MAP BASELINE	MAP 0MIN	MAP 1MIN	MAP 2MIN	MAP 3MIN	MAP 4MIN	MAP 5MIN	MAP 10MIN	MAP 15MIN	MAP 30MIN	MAP 45MIN	MAP 60MIN	MAP 75MIN	MAP 90MIN	SPO2 BASELINE	SPO2 0MIN	SPO2 1MIN	SPO2 2MIN
51	1579122	72	69	75	-	-	89	98	88	92	89	92	91	85	87	89	97	91	-	-	99	99	99	99
52	841069	77	69	70	-	-	107	109	106	95	93	99	93	95	93	95	88	87	-	-	99	99	99	98
53	1581435	76	72	-	-	-	107	113	97	90	73	66	71	89	87	87	87	-	-	-	99	99	99	99
54	1449320	91	63	71	84	-	96	92	93	88	91	88	85	84	86	102	84	88	98	-	99	99	99	99
55	1551414	63	68	71	70	-	94	96	91	85	81	79	82	84	86	83	85	88	87	-	97	97	98	97
56	1533799	83	-	-	-	-	90	93	93	95	102	101	95	92	90	93	-	-	-	-	99	99	99	99
57	1587920	70	62	-	-	-	83	83	82	79	84	83	87	83	88	84	78	-	-	-	99	99	99	99
58	1685408	72	71	-	-	-	101	95	89	75	73	73	76	81	85	86	86	-	-	-	99	99	99	99
59	1645753	71	70	68	68	-	85	84	82	71	73	77	79	82	81	83	82	82	81	-	99	99	99	99
60	1683409	83	88	82	70	-	90	93	93	95	102	101	94	92	89	93	98	97	89	-	99	99	99	99

Sr. No.	MRD NUMBER	SPO2 3MIN	SPO2 4MIN	SPO2 5MIN	SPO2 10MIN	SPO2 15MIN	SPO2 30MIN	SPO2 45MIN	SPO2 60MIN	SPO2 75MIN	SPO2 90MIN	HYPOTENSION	BRADYCARDIA	SL 0MIN	SL 5MIN	SL 10MIN	SL 15MIN	SL 30MIN	SL 45MIN	SL 60MIN	SL 75MIN	SL 90MIN	MBS 0MIN
51	1579122	99	99	98	97	97	98	98	99	-	-	NO	NO	T12	T10	T4	T4	T4	T4	T6	-	-	0
52	841069	98	99	99	98	98	99	99	98	-	-	NO	NO	L2	T12	T8	T6	T6	T6	T8	-	-	0
53	1581435	98	99	98	98	99	99	98	-	-	-	YES	NO	T12	T6	T4	T4	T4	T4	-	-	-	0
54	1449320	99	99	99	99	99	99	99	99	99	-	NO	NO	T12	T8	T6	T6	T6	T6	T6	T8	-	0
55	1551414	97	97	97	98	98	98	97	99	98	-	NO	NO	L2	T10	T4	T4	T4	T4	T4	T6	-	0
56	1533799	99	99	99	99	99	99	-	-	-	-	NO	NO	T12	T8	T6	T6	T6	-	-	-	-	0
57	1587920	99	99	99	99	99	99	99	-	-	-	NO	NO	L2	T10	T6	T6	T6	T6	-	-	-	0
58	1685408	99	99	99	99	99	99	99	-	-	-	NO	NO	T12	T6	T4	T4	T4	T4	-	-	-	0
59	1645753	99	99	99	99	99	99	99	99	99	-	NO	NO	T12	T8	T4	T4	T4	T4	T4	T6	-	0
60	1683409	99	99	99	99	99	99	99	99	99	-	NO	NO	L2	T12	T8	T6	T6	T6	T8	T8	-	0

Sr. No.	MRD NUMBER	MBS 5MIN	MBS 10MIN	MBS 15MIN	MBS 30MIN	MBS 45MIN	MBS 60MIN	MBS 75MIN	MBS 90MIN	MAX SL	MAX MBS	POST HR 0min	POST HR 15MINS	POST HR 30MINS	POST HR 45MIN	POST HR 60MIN	POST HR 2HRS	POST HR 3HRS	POST HR 4HRS	POST HR 5HRS	POST HR 6HRS	POST SPB 0MINS	POST SBP 15MINS
51	1579122	3	3	3	3	3	2	-	-	T4	3	81	74	76	78	74	78	80	82	81	74	122	112
52	841069	1	3	3	3	3	2	-	-	T6	3	88	90	87	85	87	90	96	92	98	92	130	132
53	1581435	3	3	3	3	3	-	-	-	T4	3	68	68	62	60	72	74	78	72	69	68	102	122
54	1449320	3	3	3	3	3	3	2	-	T6	3	66	67	62	63	64	65	64	62	63	67	127	129
55	1551414	3	3	3	3	3	2	2	-	T4	3	78	74	76	70	72	78	80	82	86	84	119	121
56	1533799	3	3	3	3	-	-	-	-	T4	3	82	80	72	74	76	76	78	76	74	78	112	114
57	1587920	2	3	3	3	3	-	-	-	T6	3	80	82	80	78	74	81	86	89	88	87	112	114
58	1685408	3	3	3	3	3	-	-	-	T4	3	70	68	76	74	79	82	86	82	84	80	119	123
59	1645753	3	3	3	3	3	3	2	-	T4	3	90	86	82	78	76	78	86	92	90	88	106	110
60	1683409	0	2	3	3	3	3	2	-	T4	3	82	80	72	74	76	76	78	76	82	86	110	112

Sr. No.	MRD NUMBER	POST SBP 30MINS	POST SBP 45MINS	POST SBP 60MINS	POST SBP 2HRS	POST SBP 3HRS	POST SBP 4HRS	POST SBP 5HRS	POST SBP 6HRS	POST DBP 0MINS	POST DBP 15MINS	POST DBP 30MINS	POST DBP 45MINS	POST DBP 60MINS	POST DBP 2HRS	POST DBP 3HRS	POST DBP 4HRS	POST DBP 5HRS	POST DBP 6HRS	POST MAP 0MINS	POST MAP 15MINS	POST MAP 30MINS
51	1579122	100	128	138	134	135	128	124	126	59	60	60	72	78	78	71	71	68	72	80	77	73
52	841069	131	128	126	130	130	136	132	131	70	72	69	70	70	71	68	67	69	71	90	92	90
53	1581435	118	112	128	128	134	126	118	120	70	68	74	68	71	74	72	70	68	74	81	86	89
54	1449320	130	134	135	137	136	132	132	135	76	70	72	80	74	70	72	86	84	88	93	90	91
55	1551414	120	118	122	128	128	133	132	134	70	73	74	76	72	70	71	73	79	78	86	89	89
56	1533799	115	120	119	126	130	127	128	126	72	83	88	82	83	89	86	84	83	84	85	93	97
57	1587920	108	107	111	116	120	124	118	116	68	62	69	62	70	74	81	84	72	74	83	79	82
58	1685408	126	124	120	128	124	126	127	130	72	71	76	72	70	76	78	74	72	70	88	88	93
59	1645753	112	107	113	110	114	121	110	108	68	66	69	71	73	70	74	76	67	66	81	81	83
60	1683409	115	120	119	126	128	120	115	114	72	83	88	82	83	89	86	76	72	70	85	93	97

Sr. No.	MRD NUMBER	POST MAP 45MINS	POST MAP 60MINS	POST MAP 2HRS	POST MAP 3HRS	POST MAP 4HRS	POST MAP 5HRS	POST MAP 6HRS	POST SPO2 0MINS	POST SPO2 15MINS	POST SPO2 30MINS	POST SPO2 45MINS	POST SPO2 60MINS	POST SPO2 2HRS	POST SPO2 3HRS	POST SPO2 4HRS	POST SPO2 5HRS	POST SPO2 6HRS	POST VAS 0MINS	POST VAS 15MINS	POST VAP 30MINS
51	1579122	91	98	97	92	90	87	90	99	99	99	99	96	97	99	99	99	99	0	0	0
52	841069	89	89	91	89	90	90	91	99	99	98	98	98	99	99	99	98	98	0	0	0
53	1581435	83	90	92	93	89	85	89	99	98	98	99	98	98	99	98	98	99	0	0	0
54	1449320	98	94	92	93	101	100	104	99	99	99	99	99	99	99	99	99	99	0	0	0
55	1551414	90	89	89	90	93	97	97	97	98	98	97	98	98	97	97	98	98	0	0	0
56	1533799	95	95	101	101	98	98	98	99	99	99	99	99	99	99	99	99	99	0	0	0
57	1587920	77	84	88	94	97	87	88	100	100	100	100	100	100	100	100	100	100	0	0	0
58	1685408	89	87	93	93	91	90	90	99	99	99	99	99	99	99	99	99	99	0	0	0
59	1645753	83	86	83	87	91	81	80	99	99	99	99	99	99	99	99	99	99	0	0	0
60	1683409	95	95	101	100	91	86	85	99	99	99	99	99	99	99	99	99	99	0	0	0

Sr. No.	MRD NUMBER	POST VAS 45MINS	POST VAS 60MINS	POST VAS 90MIN	POST VAS 2HRS	POST VAS 150MINS	POST VAS 3HRS	POST VAS 4HRS	POST VAS 5HRS	POST VAS 6HRS	DURATION OF ANALGESIA	POST SL 0MINS	POST SL 60MINS	POST SL 120MINS	POST SL 150MINS	POST SL 3HRS	POST SL 4HRS	POST SL 5HRS	POST SL 6HRS	POST MBS 0MINS	POST MBS 60MINS
51	1579122	0	0	0	1	2	5	-	-	-	230	T6	T12	-	-	-	-	-	-	2	0
52	841069	0	0	0	1	2	2	4	-	-	300	T8	T10	T12	-	-	-	-	-	2	0
53	1581435	0	0	0	1	2	2	4	-	-	280	T4	T8	T12	-	-	-	-	-	3	0
54	1449320	0	0	0	1	2	5	-	-	-	235	T8	T10	T12	-	-	-	-	-	2	0
55	1551414	0	0	0	1	2	2	4	-	-	310	T6	T10	S2	-	-	-	-	-	2	0
56	1533799	0	0	0	0	0	0	2	1	1	420	T6	T8	T12	-	-	-	-	-	3	3
57	1587920	0	0	0	0	0	1	3	4	-	345	T6	T8	T12	-	-	-	-	-	3	3
58	1685408	0	0	0	0	1	2	4	-	-	300	T4	T8	T12	-	-	-	-	-	3	1
59	1645753	0	0	1	1	2	4	-	-	-	240	T6	T10	T12	-	-	-	-	-	2	2
60	1683409	0	0	0	0	1	2	4	-	-	230	T8	T12	-	-	-	-	-	-	2	0

Sr. No.	MRD NUMBER	POST MBS 120MINS	POST MBS 150MINS	POST MBS 3HRS	POST MBS 4HRS	POST MBS 5HRS	POST MBS 6HRS	TIME TO T12 LEVEL	TIME TO MBS0	ONSET OF SENSORY BLOCK	ONSET OF MOTOR BLOCK	TIME TO MAX SENSORY LEVEL	TIME TO MAX MOTOR LEVEL	TIME OF 2 SEGMENT RESRESSION FROM MAX BLOCK HEIGHT
51	1579122	-	-	-	-	-	-	120	100	4	4	8	4	50
52	841069	-	-	-	-	-	-	160	100	8	8	12	8	55
53	1581435	-	-	-	-	-	-	150	105	2	2	8	2	70
54	1449320	-	-	-	-	-	-	155	135	5	5	8	5	75
55	1551414	-	-	-	-	-	-	175	130	2	8	8	2	67
56	1533799	0	-	-	-	-	-	150	120	3	1	6	1	90
57	1587920	0	-	-	-	-	-	165	100	7	10	10	10	80
58	1685408	0	-	-	-	-	-	170	130	3	3	7	3	100
59	1645753	0	-	-	-	-	-	160	130	3	5	10	2	65
60	1683409	-	-	-	-	-	-	120	100	10	7	12	12	55

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Subject:: Approval of Plan of Thesis.

This is to inform you that the Faculty of Medical Sciences in its meeting held on 25.09.2023 has approved the plan of thesis of **Sanjamjot Singh Suri**, a student of your college for **MD Anaesthesiology** along with the names of Supervisor/Co-Supervisor as under:-

Topic Plan of Thesis
Comparision of add on intrathecal fentanyl vs magnesium sulphate to hyperbaric ropivacaine for lower abdominal surgeries .

Supervisor
Dr. Kamakshi Garg
Professor
Dept. of Anaesthesiology

Co-Supervisor:-
Dr. Udeyana Singh
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The student may submit the thesis in triplicate alongwith the plan in triplicate also, to the Controller of Examinations, BFUHS, Faridkot, at least six months before the commencement of theory examination, if he/she is otherwise eligible to take the examination. He /She may be directed to attach a photocopy of this letter with the forwarding letter while submitting thesis in the University along with the letter of approval of University for change of supervisor/Co-Supervisor, change of topic, if any.

Controller of Examinations

Note :

1. *If any discrepancy found regarding topic of thesis or Supervisor/Co-Supervisor, inform undersigned within one month after issue of this letter.*

COMPARISION OF ADD ON INTRATHECAL FENTANYL VS MAGNESIUM SULPHATE TO HYPERBARIC ROPIVACAINE FOR LOWER ABDOMINAL SURGERIES

THESIS PROPOSAL

FOR APPROVAL OF SUBJECT OF THESIS TO BE SUBMITTED IN

PARTIAL FULFILMENT OF THE REQUIREMENTS

FOR THE DEGREE OF

MD

IN

ANAESTHESIOLOGY

OF THE

BABA FARID UNIVERSITY OF HEALTH SCIENCES

FARIDKOT

DR. SANJAMJOT SINGH SURI

AUGUST, 2022

DEPARTMENT OF ANAESTHESIOLOGY
DAYANAND MEDICAL COLLEGE AND HOSPITAL
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ABSTRACT OF PLAN OF THESIS

Title	COMPARISION OF ADD ON INTRATHECAL FENTANYL VS MAGNESIUM SULPHATE TO HYPERBARIC ROPIVACAINE FOR LOWER ABDOMINAL SURGERIES
For the degree of	MD Anaesthesia
Name of the candidate	Dr. Sanjamjot Singh Suri
Supervisor	Dr. Kamakshi Garg, Professor, Department of Anaesthesia, Dmch Ludhiana
Co-Supervisor	Dr. Udeyana Singh, Associate Professor, Department of Anaesthesia, Dmch Ludhiana
Institution	Dayanand Medical College and Hospital,Ludhiana
University	Baba Farid University of Health Sciences, Faridkot

Introduction: Hyperbaric ropivacaine a newer local anaesthetic agent has found its use for spinal anaesthesia with less systemic toxicity. Adding opioids as adjuvants enhance the efficacy and duration of action of the local anaesthetic and also decrease the dose required for spinal anaesthesia. Opioids, however, have various side effects like pruritis, nausea vomiting etc. Non opioid adjuvants like magnesium sulphate can also be used to increase the efficacy of local anaesthetics.

Aim of Study: To compare intrathecal fentanyl and magnesium sulphate as adjuvant to 0.75% Hyperbaric Ropivacaine in terms of onset and duration of sensory and motor block and hemodynamic parameters

Materials & methods: A total of 60 ASA grade I and II patients with age 18 years and above of either sex will be selected and divided into two groups of 30 patients each. The study will be randomized controlled, double blinded. Group F will receive 2.5ml of 0.75% hyperbaric ropivacaine + fentanyl 25mcg and group M will receive 2.5ml of 0.75% hyperbaric ropivacaine+ 0.2ml of magnesium sulphate (100mg)+ 0.3 ml of distilled water. Primary outcome of the study will be time to achieve highest level of sensory block, duration of sensory block which will be taken as time of regression of two segments in maximum block height, onset of motor block (ie modified bromage score of 3) and duration of motor block (MBS of 0). Secondary outcome of the study will to assess hemodynamic parameters (SBP, DBP, MAP and SPO2).

Clinical Significance:

This study will be used to compare efficacy of intrathecal fenytanyl vs magnesium sulphate as an adjuvant to 0.75% hyperbaric ropivacaine in terms of onset and duration of motor and sensory block

Keywords: Hyperbaric ropivacaine, Subarachnoid block, Fentanyl, Magnesium Sulphate, Post operative analgesia, lower abdominal surgeries, spinal anaesthesia

(Signature) Candidate	(Signature) Co-supervisor	(Signature) Supervisor	(Signature) Principal

CERTIFICATE OF FACILITIES AVAILABLE

This is to certify that the facilities for work on the subject of thesis titled **"COMPARISION OF ADD ON INTRATHECAL FENTANYL VS MAGNESIUM SULPHATE TO HYPERBARIC ROPIVACAINE FOR LOWER ABDOMINAL SURGERIES"** exist in the Department of Anaesthesia at Dayanand Medical College and Hospital, Ludhianaand will be provided to the candidate. We will see that the data being included in the thesis are genuine and is collected by the candidate himself under our supervision and guidance.

Supervisor

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Professor,
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DMCH, Ludhiana

Co-Supervisor

Dr. Udeyana Singh
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Head of the Department

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APPROVAL PROFORMA
BY
RESEARCH & ETHICAL COMMITTEE
DAYANAND MEDICAL COLLEGE & HOSPITAL, LUDHIANA

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Topic of Thesis	COMPARISION OF ADD ON INTRATHECAL FENTANYL VS MAGNESIUM SULPHATE TO HYPERBARIC ROPIVACAINE FOR LOWER ABDOMINAL SURGERIES
Likely date of appearing in PG examination	May/June, 2024
Date of enrollment	MARCH 7, 2022
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Signature of Members of Research Committee with Stamp	**Signature of Members of Ethics Committee with Stamp**
Dr. Harpreet Kaur (Professor & Head, Pathology)	Mr. R K Sharma (Legal Expert)
Dr. Jaspal Singh (Professor & Head, Surgery)	Dr. RamitMahajan (Associate Professor, Gastroenterology)
Dr. Dinesh Gupta (Professor & Head, Medicine)	Dr. Anu Sharma (Professor, Anatomy)
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Approved: Yes / ~~No~~

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Approved: Yes / ~~No~~

Prof. Arvind Malhotra
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PROFORMA FOR REGISTRATION OF SUBJECT FOR DISSERTATION

1	NAME OF THE CANDIDATE AND ADDRESS	DR. SANJAMJOT SINGH SURI V.P.O. JAJA TEHSIL DASUYA DISTT HOSHIARPUR, 144212
2	NAME OF THE INSTITUTE	DAYANAND MEDICAL COLLEGE AND HOSPITAL, LUDHIANA
3	COURSE OF STUDY AND SUBJECT	MD ANAESTHESIOLOGY
4	DATE OF ADMISSION OF COURSE	7TH MARCH 2022
5	TITLE OF THE TOPIC	COMPARISON OF ADD ON INTRATHECAL FENTANYL VS MAGNESIUM SULPHATE TO HYPERBARIC ROPIVACAINE FOR LOWER ABDOMINAL SURGERIES

6. BRIEF RESUME OF INTENDED WORK

6.1 NEED FOR STUDY

Spinal anaesthesia is a most preferable anaesthetic practice for gynecological, lower abdominal, pelvic, lower limb and urological surgeries. The first real spinal anaesthesia was demonstrated in humans by a german surgeon Dr August Bier on August 15th 1898 using Quincke method of entering the intrathecal space to inject cocaine in order to produce operative anaesthesia. The technique has been refined since then and has evolved into the modern concept of spinal anaesthesia. It provides simple, effective and safe analgesia in the peri-operative period. Some of its major advantages are decreased intra-operative blood loss, suppression of stress response to surgery, decreased incidence of nausea and vomiting, lesser chances of thromboembolic events and better postoperative analgesia.[1,2]

Ropivacaine is a newer longer acting local anaesthetic agent that is structurally related to bupivacaine. It is a pure S(-)enantiomer, unlike bupivacaine, which is a racemate, developed for the purpose of reducing potential toxicity and improving relative sensory and motor block profiles.[3]

Ropivacaine was introduced into clinical practice in 1996, and has consistently demonstrated an improved safety profile over bupivacaine with a reduced CNS and cardio toxic potential, together with wide clinical utility at different doses and for wide range of indications. Clearance of ropivacaine is higher than that determined for bupivacaine & its elimination half time is shorter. Higher clearance of ropivacaine may offer an advantage over bupivacaine in terms of systemic toxicity. Ropivacaine has lower lipid solubility than bupivacaine, which is responsible for its lower penetration into myelinated motor fibers and thus lesser motor blockade with greater sensory motor differentiation. It has reduced potential for cardiotoxicity and neurotoxicity and is thus safer than the racemic preparation, bupivacaine.[3]

Hyperbaric local anesthetics provide a more reliable spread and higher sensory block. Studies comparing isobaric and hyperbaric intrathecal

ropivacaine concluded that hyperbaric preparation had higher success rate, faster onset, and more consistent and predictable sensory and motor block.[4,5] Hyperbaric ropivacaine also provided longer duration of clinically useful block(upto level of T10),but it was associated with a faster recovery of sensory and motor block. Although bupivacaine and levobupivacaine have longer duration of block than ropivacaine, but intrathecal ropivacaine produced less hemodynamic side effects and was more cardiostable.

To prolong the duration of block adjuvants are used along with low dose local anaesthetics. Adjuvants are drugs that increase the efficacy or potency of other drugs when given concurrently. Neuraxial adjuvants are used to improve or prolong analgesia and decrease the adverse effects associated with high doses of a single local anaesthetic agent.[6]

Opioids act as agonist at opioid receptors which are widespread throughout the body including the brain (cerebral cortex, thalamus, hypothalamus, amygdala, basal ganglia, brainstem, reticular activating system), spinal cord and non neural tissues such as the gastrointestinal tract. Analgesia from neuraxial opioids administration is primarily mediated by binding pre and postsynaptic μ opioid receptors in the substantia gelatinosa of the dorsal horn of the spinal cord.[7] These drugs although prolong the analgesia, but their intravascular absorption can lead to side effects like respiratory depression, vomiting, pruritus and urinary retention.[8]

Non opioid drugs as adjuvants also prolong the duration of analgesia, but are devoid of side effects like nausea, vomiting or respiratory depression. Some of the non opioid drugs used intrathecally as adjuvants are magnesium sulphate, ketamine, midazolam, adenosine and NSAIDS.[9] Magnesium suphate is a centrally acting NMDA antagonist. Painful stimuli releases aspartate and glutamate which causes calcium entry into cells leading to pain signaling. $MgSO_4$, by anatagonising NMDA receptors in dorsal horn of spinal cord, inhibits this signaling and prevent central sensitization from peripheral nociceptive stimuli. It acts as a physiological antagonist of calcium and by this action in CNS, it therefore acts as an anti nociceptive.[10] It does

not cause side effects associated with opioids such as nausea, vomiting, respiratory depression and urinary retention.

With this background we tend to compare efficacy of intrathecal fentanyl vs magnesium sulphate as an adjuvant to hyperbaric ropivacaine in terms onset and duration of sensory and motor block for lower abdominal surgeries under sub arachnoid block.

6.2 REVIEW OF LITERATURE

Ropivacaine, a new long-acting amide local anaesthetic agent, is a pure S-enantiomer, with a high pKa (8.07) and relatively low-lipid solubility. Ropivacaine causes reversible inhibition of sodium ion influx, and thereby blocks impulse conduction in nerve fibres. Ropivacaine is less lipophilic than bupivacaine and is less likely to penetrate large myelinated motor fibres. Therefore, it has selective action on the pain-transmitting Aβ and C nerves rather than Aβ fibres, which are involved in motor function.[3]

Ropivacaine has less cardiotoxicity and CNS toxicity than bupivacaine. Selander D et al did a study on incidence of accidental intravenous injection of ropivacaine in 3000 patients involved in 60 clinical studies on epidural and major nerve blocks. They concluded that accidental intravenous injection of ropivacaine cause expected CNS symptoms without evident cardiotoxicity.[11]

Ropivacaine is required in ratio of 1.5:1 as compared to bupivacaine for adequate spinal blockade.[12] When identical doses of isobaric ropivacaine and bupivacaine were compared, ropivacaine was found to have almost similar efficacy but shorter duration of sensory and motor block.[13] Many studies have compared the hyperbaric prepration of these two agents[14,15]. Hyperbaric ropivacaine was associated with significantly lower incidence of hypotension. Erturk E et al did a randomized controlled trial comparing 12 mg ropivacaine and 8 mg bupivacaine, both with 20 µg fentanyl, in spinal anaesthesia for major orthopaedic surgery in geriatric patients. Sixty ASA II-III patients scheduled for hip arthroplasty were randomly assigned to receive an intrathecal injection of either 12 mg ropivacaine with 20 µg fentanyl (group R, aged 70 +/- 7 years, range 67-89) or 8 mg hyperbaric bupivacaine with 20 µg fentanyl (group B, aged 69 +/- 6 years, range 66-92). Motor and sensory block, haemodynamics and side effects were recorded. They found that there were no significant differences between the groups with regard to the mean time to onset of sensory block at T10, the extent of spread, or mean time to maximum spread and regression of sensory block in the ropivacaine group was more

rapid as demonstrated by duration at T10 (P<0.0167) and total duration of sensory block (P<0.0167). Patients in the ropivacaine group had more rapid recovery from motor block (P<0.0167) and shorter times to independent mobilization (P<0.0167). There were no significant differences between the bupivacaine and the levobupivacaine groups. They concluded that ropivacaine caused less motor block and hemodynamic side effects than bupivacaine which can be beneficial, especially in geriatric patients with cardiac pathology.[16]

In order to overcome this limitation various adjuvants can be added to intrathecal ropivacaine. These adjuvants help prolong the anaesthesia along with reduction of dose of local anaesthetic required for block. They also potentiate the analgesic effect of local anaesthetic.[6]

Opioids are most commonly used adjuvants to intrathecal local anaesthetics. Several studies have been conducted to elucidate the efficacy of intrathecal ropivacaine with fentanyl.

Chan JC et al did a randomized controlled trail to study effect of intrathecal fentanyl added to ropivacaine for cesarean surgeries. Fifty-nine healthy, full-term parturients scheduled for elective cesarean delivery under spinal anaesthesia were randomly assigned in a double-blind fashion to receive either fentanyl 10 µg or normal saline 0.2 mL added to 0.5% hyperbaric ropivacaine 18 mg. Characteristics of spinal block, intraoperative quality of spinal anaesthesia, side effects, complete analgesia (time to first feeling of pain), and effective analgesia (time to first request of analgesics) were assessed. They found that duration of sensory block was prolonged in the fentanyl group (P <.05). Duration of motor block was similar in both groups. The quality of intraoperative analgesia was better in the fentanyl group (P <.05). Incidence of side effects did not differ between groups. Duration of complete analgesia (143.2 +/- 34.2 minutes v 101.4 +/- 21.4 minutes; P <.001) and effective analgesia (207.2 +/- 32.2 minutes v 136.3 +/- 14.1 minutes; P <.001) were prolonged in the fentanyl group. They concluded that adding fentanyl 10 µg to hyperbaric ropivacaine 18 mg for spinal anesthesia for cesarean delivery improves intraoperative anaesthesia and increases the analgesia in the early postoperative period.[17]

Bathari R et al did a randomized controlled trail to compare effect of fentanyl or clonidine when added to intrathecal hyperbaric ropivacaine. Sixty ASA I and II patients were randomised to receive spinal anaesthesia with hyperbaric ropivacaine alone (group R) or with clonidine (group RC) or with fentanyl (group RF). The three groups were similar in mean time to onset of sensory block at T10, height of block and time to maximum block. Sensory regression to S2 took longer in Groups RF and RC compared with Group R ($p=0.001$ and $p<0.01$, respectively). Time to requirement of rescue analgesia was longer in Groups RF and RC compared with Group R ($p=0.023$ and 0.002, respectively).Time for complete regression of motor block and time to voiding were longer in group RC compared with group R ($p = 0.022$ and $p = 0.013$, respectively). They concluded that the addition of fentanyl 30 µg to hyperbaric ropivacaine may be superior to addition of clonidine 15 µg for knee arthroscopy as it provides a similar prolongation of sensory block and analgesia without prolonging motor block and time to micturation.[18]

Gupta K et al did a prospective study to see the effect intrathecal fentanyl as an adjuvant to 0.75% isobaric ropivacaine for infraumbilical surgery under subarachnoid block. One hundred sixty adult consented patients of either gender with American Society of Anaesthesiologist I and II scheduled for infraumbilical surgery were randomized into two groups of 80 patients each to receive either intrathecal study solution of 4 mL of 0.75% ropivacaine with 0.4 mL of 0.9% sodium chloride. They concluded that the intrathecal fentanyl has accelerated the onset time to achieve sensory blockade to T10 dermatome and motor blockade. Small dose of intrathecal fentanyl with ropivacaine has prolonged the duration of analgesia in the early post-operative period when compared with intrathecal ropivacaine alone. The intraoperative hemodynamic variability showed no statistically significant differences between groups. The mean onset time of adequate sensory analgesia at T10 dermatome was 3.2 ± 1 min in Group I and 3.5 ± 1 min in Group II. The mean time to reach the highest level of T6 for sensory blockade was 9.8 ± 3.2 min in Group I and 8.13 ± 1.92 min in Group II with no statistically significant difference.[19]

Various side effects are associated with use of intrathecal opiods like nausea, vomiting, pruritis, urinary retention and respiratory depression. Ali MA et al did a prospective randomized double-blind study in which 243 parturients undergoing cesarean section under spinal anaesthesia were randomly allocated to receive 10, 15, or 25 μg of intrathecal fentanyl with 10 mg of 0.5% hyperbaric bupivacaine. The side effects assessed were pruritus, nausea, vomiting, dizziness, and decrease in saturation and respiratory rate. Patients receiving 25 μg of fentanyl had a significantly higher incidence of pruritus, nausea, and dizziness in addition to a significantly prolonged sensory and motor block ($P <$ 0.001). All patients in three groups had adequate surgical anaesthesia with no statistically significant difference in the onset of block, quality of surgical anaesthesia, pain scores, neonatal APGAR score, hemodynamic variables, and need for vasopressor.[20]

Weigl W et al did a randomized controlled study on perioperative analgesia after intrathecal fentanyl and morphine or morphine alone for cesarean section. The study included 60 parturients scheduled for elective caesarean section. Spinal anaesthesia consisted of bupivacaine with either morphine 100 μg (M group), or fentanyl 25 μg and morphine 100 μg (FM group). The frequency of intraoperative pain and pethidine consumption in the 24 hours postoperatively was recorded. They found that fewer patients in the FM group required additional intraoperative analgesia (P<.01, relative risk 0.06, 95% confidence interval [CI] 0.004–1.04). The FM group was non inferior to the M group for 24-hour opioid consumption (95% CI −10.0 mg to 45.7 mg, which was below the pre specified boundary of 50 mg). Pethidine consumption in postoperative hours 1 to 12 was significantly higher in the FM group (P=.02). Postoperative nausea and vomiting (PONV) were more common in the FM group (P=.01). Visual analog scale scores, effective analgesia, APGAR scores, and rates of pruritus and respiratory depression were similar between the groups. They concluded that intrathecal combination of fentanyl and morphine may provide better perioperative analgesia than morphine alone in caesarean section and could be useful when the time from anaesthesia to skin incision is short. However, an increase in PONV and possible

acute spinal opioid tolerance after addition of intrathecal fentanyl warrants further investigation using lower doses of fentanyl.[21]

Magnesium sulphate is a non opioid drug that has been used as an adjuvant to local anaesthetics for intrathecal block. Magnesium sulphate acts by anatagonising NMDA receptors in dorsal horn of spinal cord and thus blocking pain signals.[10] It does not produce side effects like pruritus, nausea, vomiting, respiratory depression as seen with opioids like fentanyl

J Pascual-Ramírez et al did a meta analysis of randomized clinical trials comparing a 50 to 100 mg dose of intrathecal magnesium sulfate versus placebo in addition to an intrathecal local anaesthetic and/or opiate for a below-umbilicus procedure. Twelve studies totaling 817 patients were included. The "time to first analgesia request" was at least 35 minutes longer when intrathecal magnesium was included in the intervention (SDM 0.94, 95%CI 0.51 to 1.37, P<0.001). The "onset time to sensory block" (SDM 0.64, 95%CI 0.15 to 1.12, P=0.01) and the "time to maximal motor block" (SDM 0.97, 95%CI 0.28 to 1.67, P=0.006) were 2.4 minutes slower with intrathecal magnesium. There was no difference in "time to full motor recovery, incidence of pruritis, postoperative nausea and vomiting, bradycardia, low blood pressure and urinary retention". No cases of respiratory depression or neurotoxicity were recorded in these studies. They concluded that the inclusion of 50 to 100 mg of intrathecal magnesium in a spinal anaesthetic prolongs opiate analgesia duration.[22]

Paleti S et al did a randomized clinical trial of intrathecal magnesium sulphate versus midazolam with epidural administration of 0.75% ropivacaine for patients with preeclampsia scheduled for elective cesarean section. Fifty pre-eclamptic parturients were randomly allocated to one of the two groups of 25 each to either receive intrathecal magnesium sulfate (50 mg) or intrathecal midazolam (1 mg) in combination with epidural ropivacaine (0.75%; 14-16 ml). The onset and duration of sensory and motor blockade, duration of postoperative analgesia, postoperative visual analogue scores for pain, and perioperative side effects were noted. They found that the onset times

of sensory and motor blockade were faster in midazolam than in magnesium group ($P < 0.01$). Duration of sensory and motor blockade, and time to first request of analgesia were significantly longer in the magnesium group compared to the midazolam group ($P < 0.01$). They concluded that intrathecal magnesium with epidural ropivacaine significantly prolonged postoperative analgesia compared to intrathecal midazolam without any complications.[23]

Deepa T et al did a prospective randomized double-blind parallel-group study to compare effect of addition of intrathecal magnesium sulphate to 0.5% hyperbaric bupivacaine and 0.5% isobaric levobupivacaine on duration of analgesia in parturients undergoing elective caesarean section. They found that the duration of analgesia did not show a significant difference in the two groups (P = 0.175). The sensory onset time was faster in group I (3.5 ± 1.3 min) as compared to that in group II (4.8 ± 2 min; P = 0.004). The onset of motor blockade was not different in the two groups (P = 0.265), but there was a significant delay (P = 0.002) in motor recovery in group II (267 ± 130.6 min) as compared to group I (225 ± 85.4 min). Hemodynamics were comparable in the two groups.[24]

After thorough search of literature, we could not find any study comparing fentanyl with magnesium sulphate when used as adjuvant with 0.75% hyperbaric ropivacaine in intrathecal block. Hence we propose to compare the efficacy of these drugs in terms of onset and duration of sensory and motor block for lower abdomen surgeries under subarachnoid block. We will also be comparing perioperative hemodynamic charaterstics of these drugs.

6.3 AIMS AND OBJECTIVES OF THE STUDY

To assess:

1. Safety and efficacy of drugs in terms of onset and duration of sensory and motor block.
2. Intraoperative and postoperative hemodynamic changes
3. Adverse reaction, if any

7. MATERIALS AND METHODS

7.1 SOURCE OF DATA

After acceptance by the institutional ethical committee, this randomized controlled double blind study will be conducted in the Department of Anaesthesiology DMCH, Ludhiana. Sixty ASA grade I and II patients of either gender, aged 18 and above posted for elective lower abdominal surgeries under subarachnoid block will be considered for the study after a written informed consent is obtained from them.

7.2 METHOD OF COLLECTION OF DATA

INCLUSION CRITERIA-

- ASA I and ll
- Age 18 and above
- Either gender

EXCLUSION CRITERIA-

- Patients not giving consent for spinal anaesthesia
- Patients who are allergic to the study drugs being used.
- Patients in whom spinal anaesthesia is contraindicated

GROUP ALLOCATION: Patients selected for study will be divided into two groups based on computer generated random numbers contained in sealed, sequentially numbered envelopes

Group F – Patients in this group will receive 2.5ml of 0.75% hyperbaric ropivacaine + 0.5ml of fentanyl (25mcg) to make a total volume of 3mL
Group M – Patients in this group will receive 2.5ml of 0.75% hyperbaric ropivacaine + 0.2ml of magnesium sulphate (100mg) + 0.3ml of distilled water to make total volume of 3mL.

PREANAESTHETIC CHECK UP

All the patients will undergo a thorough preanaesthetic checkup 1 day prior to the procedure which will include detailed history and examination. Pre operative

investigations (complete haemogram, PT-INR, renal function test, serum electrolytes, chest x-ray and electrocardiogram) will also be done as per institutional protocol. Patients hemodynamic parameters like blood pressure, pulse rate, respiratory rate and oxygen saturation (SpO_2) will also be assessed a day before the procedure The patients will be kept nil per oral for at least 8 hours before surgery. Tablet pantoparazole 40 mg and Tablet alprazolam 0.25mg will be given at midnight and at 6 a.m. in the morning on the day of surgery. On the day of surgery, immediately after pre induction evaluation patient will be shifted to the operation theatre

ANAESTHESIA TECHNIQUE

After the patient has been shifted on OT table, pre induction monitors will be attached to the patient to note HR, NIBP, SpO_2 and ECG. An intravenous line using 18G cannula will be secured and intravenous crystalloids will be started. Three readings of HR, NIBP, SpO_2 will be taken and the mean of three readings will be taken as baseline vital parameters. Patient will be made to sit with back exposed and under all aseptic precautions the back of the patient will be cleaned and draped and then L3-L4 intervertebral space will be palpated. 2 ml of 2% lignocaine will be locally infilterated in the area of palpated space. A 26 gauge Quincke needle will then be inserted in the space. After the loss of resistance to needle insertion and confirmation of free flow of CSF, the drug mixture will be injected in the space.

The drug mixture to be given will be decided by coded envelopes made by a person not involved in the study. The envelope will be opened by the anaesthesiologist of the operation theatre. After administration of the drug in the subarachnoid space, the patient will be made to lie in supine position.

Onset and duration of sensory and motor block and regular monitoring of HR, NIBP (systolic, diastolic and mean), ECG and SpO_2 will be done by the attending anaesthesiologist during the surgery. After completion of surgery patient will be shifted to recovery room

OBSERVATION

Onset of sensory block will be assessed by sterile pinprick method starting from below to above every 5 minutes and will be taken as the point of time at which

patient will be unable to feel the pinprick at the level of T8. After that level will be assessed every 15 minutes. Duration of sensory block will be taken as time of regression of two segments in maximum block height. Onset of motor block will be taken as time to attain modified bromage score of 3 after intrathecal injection of drug.

MODIFIED BROMAGE SCORE

0. Free movement of legs and feet.
1. Uable to raise extended legs but able to flex knees with free movement of feet.
2. Unable to flex knees but with free movement of feet.
3. Unable to move legs and feet.

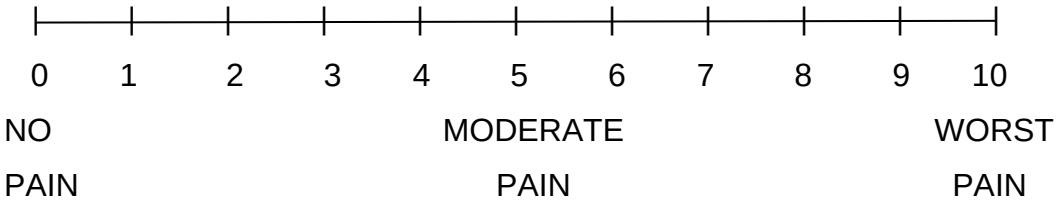
Duration of motor block will be taken as the time from onset of motor block till the attainment of modified bromage score of 0. Patients with failed subarachnoid block will be excluded from the study.

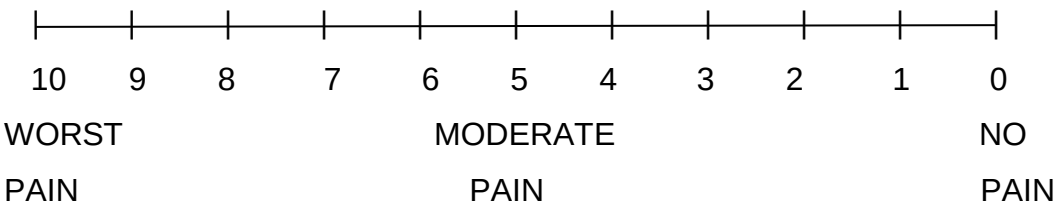
INTRAOPERATIVE ASSESSMENT

The sensory block will be recorded at 0, 5, 10 and 15 mins after intrathecal injection and subsequently every 15 mins. The highest level of sensory block will be recorded by pinprick at midclavicular line anteriorly every 5 minutes for the first 15 minutes and then every 15 minutes till 90 minutes. Motor block will also be recorded at 0, 5, 10 and 15 minutes and then every 15 minutes till 90 minutes. Haemodynamic parameters i.e. HR, NIBP (systolic, diastolic and mean) and SpO_2 of the patient will be recorded at every minute for first 5 minutes and then every 5 minutes till 90 minutes. Hypotension will be defined as a drop in systolic blood pressure of more than 20% from baseline (or) systolic BP of less than 90 mm of Hg. It will be managed with Inj. ephedrine intravenously 6 mg, rapid i/v fluid infusion (5ml/kg body weight) and oxygen supplementation. Bradycardia will be defined as heart rate of <60/min and managed with Inj. atropine 0.6 mg. Inj. ondansetron 4mg i/v will be given to patients in case patient complaints of nausea and vomiting. Respiratory depression will be defined as respiratory rate of < 8/ min and/or oxygen saturation of <90% and will be managed by oxygen supplementation, bag and mask ventilation or endotracheal intubation and IPPV as appropriate.

POST OPERATIVE ASSESSMENT

Immediately after shifting the patient to recovery room HR, NIBP (systolic,diastolic and mean), and Respiratory rate and SpO_2 will be recorded every 15 minutes for first 60 minute and then hourly till 6 hours. Quality of postoperative analgesia will be assessed using Visual analogue scale (which range from 0 indicating no pain till 10 indicating severe intolerable pain) which will be explained preoperatively to the patient.





VAS score will be recorded at 0, 2, 4 and 6 hours postoperatively. Patients with VAS score of 4 or more will be given injection tramadol 50mg intravenously slowly. Any post operative complication requiring intervention will also be recorded. Total supplemental analgesic required for every patient will be recorded. Postoperatively, sensory and motor block level will be recorded every 15 minutes till 60 minutes, half hourly till third hour and then hourly till the end of 6 hours. Patients will be discharged from the recovery room after complete resolution of motor block.

OUTCOME:

PRIMARY OUTCOME:

- Onset and duration of sensory block and motor block

SECONDARY OUTCOME:

- Perioperative hemodynamic characterstics
- Adverse reactions if any

SAMPLE SIZE CALCULATION

The formula used is as under:

$n = (\sigma 12 + \sigma 22) (Z\alpha + Z\beta)^2/(m1 – m2)^2$

Where,

Zα = Value of standard normal variate corresponding to α level of significance (1.96)

Zβ = The standard normal deviate for desired power (0.842)

m = Average

σ = Standard deviation

Assumptions:

From the study conducted by Ronald Bathari et al

Mean Group (m1) = 128.2

Mean Group (m2) = 156

Coefficient of variation = 150%

Standard deviation Group (σ1) = 24.9

Standard deviation (σ2) = 42.4

With the above assumptions the sample size for 95% confidence level & 80% power works out 25 in each group. This number has been increased to 30 each group to allow for a predicted dropout from treatment.

STATISTICAL ANALYSIS

Data will be described in terms of range; mean ±standard deviation (± SD), median, frequencies (number of cases) and relative frequencies (percentages) as appropriate. To determine whether the data is normally distributed, a Kolmogorov-Smirnov test will be used. Comparison of quantitative variables between the study groups will be done using Student t-test and Mann Whitney U test for independent samples for parametric and non-parametric data respectively. For comparing categorical data, Chi square (χ2) test will be performed and fisher exact test was used when the expected frequency is less than 5. A probability value (p value)less than 0.05 will be considered statistically significant. All statistical calculations will be done using

(Statistical Package for the Social Science) SPSS 21version (SPSS Inc., Chicago, IL, USA) statistical program for Microsoft Windows

7.3 DOES THE STUDY REQUIRE ANY INVESTIGATIONS OR INTERVENTIONS TO BE CONDUCTED ON PATIENTS OR OTHER HUMANS OR ANIMALS? IF SO, PLEASE DESCRIBE BRIEFLY.

No

7.4 HAS ETHICAL CLEARENCE BEEN OBTAINED FROM YOUR INSTITUTION IN CASE OF 7.3?

Attached herewith

8. LIST OF REFRENCES

1. Chattopadhyay A, Maitra S, Sen S, Bhattacharjee S, Layek A, Pal S, et al. A study to compare the analgesic efficacy of intrathecal bupivacaine alone with intrathecal bupivacaine midazolam combination in patients undergoing elective infraumbilical surgery. Anesthesiol Res Pract. 2013;2013:567134.

2. Mulroy MF, McDonald SB. Regional anesthesia for outpatient surgery. Anesthesiol Clin North Am. 2003;21:289–303.

3. Hansen TG. Ropivacaine: a pharmacological review. Expert Rev Neurother. 2004:781–91.

4. Fettes PDW, Hocking G, Peterson MK, Luck JF, Wildsmith J a. W. Comparison of plain and hyperbaric solutions of ropivacaine for spinal anaesthesia. Br J Anaesth. 2005;94:107–11.

5. Kallio H, Snäll EVT, Tuomas CA, Rosenberg PH. Comparison of hyperbaric and plain ropivacaine 15 mg in spinal anaesthesia for lower limb surgery. Br J Anaesth. 2004;93:664–9.

6. Swain A, Nag DS, Sahu S, Samaddar DP. Adjuvants to local anesthetics: Current understanding and future trends. World J Clin Cases. 2017;5:307–23.

7. Carvalho B. Respiratory depression after neuraxial opioids in the obstetric setting. Anesth Analg. 2008;107:956–61.

8. Brull R, Macfarlane AJR, Chan VWS. Spinal, Epidural and Caudal Anaesthesia. In: Cohen NH, Eriksson Ll, Fleisher LA, Weiner-kronish JP, Young WL, (editors). Miller's Anaesthesia. Vol 1/8th edition, Elsevier Philadelphia; 2015. p. 1684-1720. In.

9. Shukla D, Verma A, Agarwal A, Pandey HD, Tyagi C. Comparative study of intrathecal dexmedetomidine with intrathecal magnesium sulfate used as adjuvants to bupivacaine. J Anaesthesiol Clin Pharmacol. 2011;27:495–9.

10. Ascher P, Nowak L. Electrophysiological studies of NMDA receptors. Trends in Neurosciences. 1987;10:284–8.

11. Selander D, Sjövall J, Waldenlind L. Accidental I.V. Injections of Ropivacaine: Clinical Experiences of Six Cases. Reg Anesth Pain Med. 1997;22(Suppl 2):70.

12. Gautier PE, De Kock M, Van Steenberge A, Poth N, Lahaye-Goffart B, Fanard L, et al. Intrathecal ropivacaine for ambulatory surgery. Anesthesiology. 1999;91:1239–45.

13. McNamee DA, McClelland AM, Scott S, Milligan KR, Westman L, Gustafsson U. Spinal anaesthesia: comparison of plain ropivacaine 5 mg ml(-1) with bupivacaine 5 mg ml(-1) for major orthopaedic surgery. Br J Anaesth. 2002;89:702–6.

14. Whiteside JB, Burke D, Wildsmith J a. W. Comparison of ropivacaine 0.5% (in glucose 5%) with bupivacaine 0.5% (in glucose 8%) for spinal anaesthesia for elective surgery. Br J Anaesth. 2003;90:304–8.

15. Luck JF, Fettes PDW, Wildsmith J a. W. Spinal anaesthesia for elective surgery: a comparison of hyperbaric solutions of racemic bupivacaine, levobupivacaine, and ropivacaine. Br J Anaesth. 2008 ;101:705–10.

16. Erturk E, Tutuncu C, Eroglu A, Gokben M. Clinical comparison of 12 mg ropivacaine and 8 mg bupivacaine, both with 20 microg fentanyl, in spinal anaesthesia for major orthopaedic surgery in geriatric patients. Med Princ Pract. 2010;19:142–7.

17. Chung CJ, Yun SH, Hwang GB, Park JS, Chin YJ. Intrathecal fentanyl added to hyperbaric ropivacaine for cesarean delivery. Reg Anesth Pain Med. 2002;27:600–3.

18. Bathari R, Bhalotra AR, Anand R, Kumar V. A randomised trial to compare the effect of addition of clonidine or fentanyl to hyperbaric

ropivacaine for spinal anaesthesia for knee arthroscopy. null. 2016;22:14–8.

19. Gupta K, Singh S, Sharma D, Gupta PK, Krishan A, Pandey MN. Intrathecal fentanyl as an adjuvant to 0.75% isobaric ropivacaine for infraumbilical surgery under subarachnoid block: A prospective study. Saudi J Anaesth. 2014;8:64–8.

20. Ali MA, Ismail S, Sohaib M, Aman A. A double-blind randomized control trial to compare the effect of varying doses of intrathecal fentanyl on clinical efficacy and side effects in parturients undergoing cesarean section. J Anaesthesiol Clin Pharmacol. 2018;34:221–6.

21. Weigl W, Bieryło A, Wielgus M, Krzemień-Wiczyńska Ś, Kołacz M, Dąbrowski MJ. Perioperative analgesia after intrathecal fentanyl and morphine or morphine alone for cesarean section: A randomized controlled study. Medicine (Baltimore). 2017;96:e8892.

22. Pascual-Ramírez J, Gil-Trujillo S, Alcantarilla C. Intrathecal magnesium as analgesic adjuvant for spinal anesthesia: a meta-analysis of randomized trials. Minerva Anestesiol. 2013;79:667–78.

23. Paleti S, Prasad PK, Lakshmi BS. A randomized clinical trial of intrathecal magnesium sulfate versus midazolam with epidural administration of 0.75% ropivacaine for patients with preeclampsia scheduled for elective cesarean section. J Anaesthesiol Clin Pharmacol. 2018;34:23–8.

24. Deepa T, Chandran D. Effect of addition of intrathecal magnesium sulphate to 0.5% hyperbaric bupivacaine and 0.5% isobaric levobupivacaine on duration of analgesia in parturients undergoing elective caesarean section: A prospective randomised study. J Anaesthesiol Clin Pharmacol. 2021;37:633–8.

PROFORMA

S. No.

MRD No.

Initials of patient

Randomization No.

Age/Sex

BMI

Height

Weight

ASA

Co-morbidities

Diagnosis

Proposed Surgery

Date of surgery

Duration of Surgery

Known Drug Allergies

Preoperative Investigations

Investigation	**Lab Values**
Hemoglobin	
Platelet count	
Prothrombin Time/ International Normalized Ratio	
Urea	
Creatinine	

Signature of Candidate **Signature of Supervisor**

INTRAOPERATIVE MONITORING

HEMODYNAMIC PARAMETERS

Time in minutes	HR/min	SBP (mmHg)	DBP (mmHg)	MAP (mmHg)	SpO2 (%)
Baseline (mean of 3 readings)					
0 (immediately after spinal injection)					
1					
2					
3					
4					
5					
10					
15					
30					
45					
60					
75					
90					

Signature of Candidate **Signature of Supervisor**

LEVEL OF SENSORY AND MOTOR BLOCK

Time in minutes	0	5	10	15	30	45	60	75	90
Level of sensory block									
Level of motor block									
Bromage Score									

Maximum level of sensory block:

Maximum level of motor block:

Time to attain maximum level of sensory block:

Time to attain maximum motor block:

MODIFIED BROMAGE SCORE

0. Free movement of legs and feet.
1. Unable to raise extended legs but able to Flex knees with free movement of feet.
2. Unable to Flex knees but with free movement of feet.
3. Unable to move legs and feet

Signature of Candidate **Signature of Supervisor**

POSTOPERATIVE MONITORING

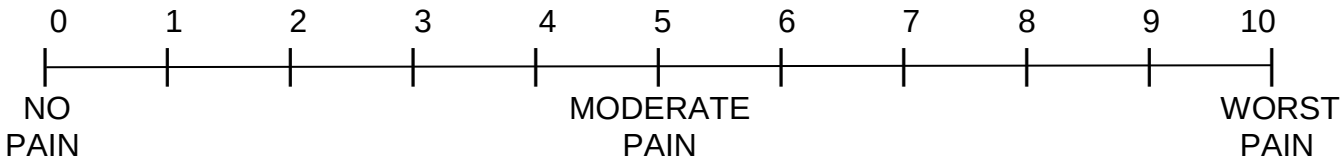
I. HEMODYNAMIC PARAMETERS

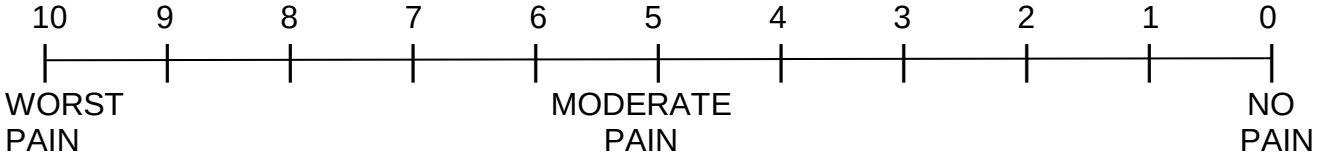
Time	HR/min	SBP (mmHg)	DBP (mmHg)	MAP (mmHg)	SpO2 (%)
0mins					
15mins					
30mins					
45mins					
60mins					
2 hours					
3 hours					
4 hours					
5 hours					
6 hours					

II. ANALGESIA REQUIRMENT

Time	0 mins	15 mins	30 mins	45 mins	60 mins	90 Mins	120 Mins	150 mins	3 hours	4 hours	5 hours	6 hours
VAS Score (0 to 10)												

Time of first analgesia request





Signature of Candidate **Signature of Supervisor**

III SENSORY BLOCK

TIME	0 mins	60 mins	120 mins	150 mins	3 hours	4 hours	5 hours	6 hours
LEVEL OF SENSORY BLOCK								
LEVEL OF MOTOR BLOCK								

Time of regression to T-12 level:

Time until full recovery of motor function:

TIME POINTS

Time of Intrathecal Injection	
Sensory Level T10	
Highest/Max. sensory level	
MBS grade 3	
MBS grade 0	
Sensory Level S2	

Signature of Candidate **Signature of Supervisor**

TIME PERIODS

S. No.	Parameters	Duration (in minutes)
1.	Time of onset of sensory block	
2.	Time of onset of motor block	
3.	Time to reach peak sensory level	
4.	Time to reach MBS grade 3	
5.	Time to achieve complete sensory regression to S2	
6.	Time to achieve complete motor regression to MBS grade 0	
7.	Duration of analgesia	

ADVERSE EFFECTS

Adverse Effects	**Time of adverse effect**	**Treatment administered**
Nausea/Vomiting		
Dizziness		
Others		

Signature of Candidate **Signature of Supervisor**

INFORMED PATIENT CONSENT

Date: _____

I…….D/o, W/o, S/o……..…… am willing to participate in the study **"A COMPARISION OF INTRATHECAL FENTANYL VS MEGNESIUM SULPHATE AS AN ADJUVANT TO HYPERBARIC ROPIVACAINE FOR LOWER ABDOMINAL SURGERIES"** The procedure with its complications has been explained to me in local vernacular language. I have fully understood that no special tests and extra expenditure in any form, merely for the purpose of thesis is being carried out. I am free to opt out the study any time without assigning any reason.

……. ……
Signature of the Witness Signature of the patient

Name:

Signature of Candidate **Signature of Supervisor**

मरीज अनुमति फार्म

तिथि _____

मैं _____ पत्नी/पुत्र/पुत्री _____

निवासी _____

इस शोधकार्य "**A COMPARISION OF INTRATHECAL FENTANYL VS MEGNESIUM SULPHATE AS AN ADJUVANT TO HYPERBARIC ROPIVACAINE FOR LOWER ABDOMINAL SURGERIES"** में भाग लेने के लिए सहमत हूँ। मैं इस शोधकार्य में भाग लेने के लिए अपनी स्वेच्छा से तैयार हूँ। मैं पुष्टि करता/करती हूँ की यह स्वीकृति देने के लिए मुझे कोई आर्थिक प्रलोभन नहीं दिया गया और न ही दबाव डाला गया है। मुझे इस शोधकार्य का उद्देश्य स्पष्ट कर दिया गया है और मुझे यह विश्वास है की यह विज्ञान और मानवता के लाभ के लिए है। मुझे इस शोधकार्य में होने वाले जोखिम के बारे में समझा दिया गया है और मेरी समझ में यह जोखिम बहुत मामुली है।

मैं इस शोधकार्य में भाग लेने के सम्बन्ध में किसी भी समय अपनी अस्वीकृति व्यक्त कर सकता/सकती हूँ और मेरे अस्वीकृति व्यक्त करने का मेरे इलाज पर कोई प्रभाव नहीं पड़ेगा।

_____	_____
गवाह के हस्ताक्षर	रोगी के हस्ताक्षर/अंगूठे का निशान
नाम:	नाम:

_____

अन्वेषक के हस्ताक्षर

_____

विद्यार्थी के हस्ताक्षर

ਮਰੀਜ਼ ਰਜ਼ਾਮੰਦੀ ਫਾਰਮ

ਮਿਤੀ_____

ਮੈ_____ਪਤਨੀ/ਪੁੱਤਰ/ਪੁੱਤਰੀ_____

ਵਾਸੀ _____

“COMPARISION OF ADD ON INTRATHECAL FENTANYL VS MEGNESIUM SULPHATE TO HYPERBARIC ROPIVACAINE FOR LOWER ABDOMINAL SURGERIES” ਤੇ ਚਲ ਰਹੀ ਖੋਜ ਵਿਚ ਹਿੱਸਾ ਲੈਣ ਲਈ ਰਜ਼ਾਮੰਦ ਹਾਂ। ਇਸ ਖੋਜ ਕੰਮ ਵਿਚ ਹਿੱਸਾ ਲੈਣ ਲਈ ਮੈ ਆਪਣੀ ਮਰਜ਼ੀ ਨਾਲ ਤਿਆਰ ਹਾਂ। ਮੈ ਇਹ ਦਸਣਾ ਚਾਹੁੰਦਾ ਹਾਂ/ ਚਾਹੁੰਦੀ ਹਾਂ ਕੇ ਇਹ ਰਜ਼ਾਮੰਦੀ ਦੇਣ ਵਾਸਤੇ ਮੈਨੂ ਕਿਸੇ ਵੀ ਤਰਾਂ ਦਾ ਲੋਭ-ਲਾਲਚ ਨਹੀ ਦਿੱਤਾ ਗਿਆ ਅਤੇ ਨਾ ਹੀ ਕੋਈ ਦਬਾ ਪਾਇਆ ਗਿਆ ਹੈ। ਮੈਨੂ ਇਸ ਖੋਜ ਦਾ ਮਨੋਰਥ ਸਮਝਾ ਦਿੱਤਾ ਗਿਆ ਹੈ ਅਤੇ ਮੈਨੂ ਇਹ ਭਰੋਸਾ ਦਵਾਇਆ ਗਿਆ ਹੈ ਕੇ ਇਹ ਖੋਜ ਵਿਗਿਆਨ ਅਤੇ ਮਾਨਵਤਾ ਦੀ ਭਲਾਈ ਲਈ ਹੈ। ਮੈਨੂ ਇਸ ਖੋਜ ਵਿਚ ਹੋਣ ਵਾਲੇ ਖਤਰੇ ਬਾਰੇ ਸਮਝਾ ਦਿੱਤਾ ਗਿਆ ਹੈ ਅਤੇ ਮੈਨੂ ਇਹ ਯਕੀਨ ਹੈ ਕੇ ਇਹ ਖਤਰਾ ਬਹੁਤ ਮਾਮੂਲੀ ਹੈ। ਮੈਨੂ ਇਸ ਖੋਜ ਕੰਮ ਵਿਚ ਹਿੱਸਾ ਲੈਣ ਦਾ ਢੰਗ – ਤਰੀਕਾ ਸਮਝਾ ਦਿੱਤਾ ਗਿਆ ਹੈ।

ਮੈ ਇਸ ਖੋਜ ਕੰਮ ਵਿਚ ਹਿੱਸਾ ਲੈਣ ਬਾਰੇ ਆਪਣੀ ਰਜ਼ਾਮੰਦੀ ਕਿਸੇ ਵੀ ਸਮੇ ਵਾਪਸ ਲੈ ਸਕਦਾ ਹਾਂ/ ਸਕਦੀ ਹਾਂ ਅਤੇ ਮੇਰੀ ਰਜ਼ਾਮੰਦੀ ਵਾਪਸ ਲੈਣ ਦਾ ਮੇਰੇ ਇਲਾਜ ਤੇ ਕੋਈ ਅਸਰ ਨਹੀ ਹੋਵੇਗਾ।

_____ _____

ਗਵਾਹ ਦੇ ਹਸਤਾਖਰ ਮਰੀਜ਼ ਦੇ ਹਸਤਾਖਰ

ਮਿਤੀ_____ ਮਿਤੀ_____

ਪਤਾ _____ ਪਤਾ _____

_____

ਨਿਰੀਖਕ ਦੇ ਹਸਤਾਖਰ

_____

ਸਿਖਿਆਰਥੀ ਦੇ ਹਸਤਾਖਰ